

The Crossbow

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The Crossbow

Chapter 1

HISTORICAL NOTES

It is fairly certain that the crossbow was introduced as a military weapon into Britain by the Norman invaders in the year 1066, the weapon at this time having a wood bow. This crossbow was cocked by hand with the assistance of a foot stirrup on the forend of the stock. This held the stock firmly against the ground when drawing back the string.

The crossbow at this time was considered the deadliest of all weapons and, due to the barbarous wounds inflicted by them, the Lateran Council in the year 1139, issued an interdict against the use of the crossbow in Christian warfare, although its use against infidels was permitted. King Richard I was an expert shot with the weapon. So fond was he of the crossbow that on one occasion when ill with fever during the siege of Ascalon he demanded to be laid on his palliasse and carried within bow range of the fort and proceeded to assail the enemy with bolts from his crossbow. Much of the crossbow's great popularity was certainly due largely to the encouragement Richard gave his troops to employ the weapon. It was more than unfortunate perhaps that Richard himself was killed by a crossbow bolt at the siege of Castle Chaluz near Limoges in France, 1199, although many considered his death in this manner just retribution for his defiance of the Papal interdict against the crossbow.

During the reign of Richard I it is most probable that the bows were of a composite nature, steel bows being of a later date. During the Twelfth Century the crossbow was considerably improved and a heavy steel bow was in use with a mechanical aid, windlass, cranequin or lever being employed to cock it, many of these weapons having a draw weight of over one quarter ton; the heavier and more powerful siege crossbow drawing over half a ton.

The bolts used in medieval times and shot from powerful battle crossbows were of seasoned hardwood about 12" in length, and from 1/2" to 5/8" in diameter. A sharply pointed metal head was fitted over the shaft; and the fletchings, usually two in number, were of varnished parchment or of thin leather. These sharply pointed bolts would pierce, at a fair range, most armour of the period; except perhaps when striking a glancing blow at a curved surface. To reduce the chance of

bolts glancing off heavy armour, a type of bolt known as a quarrel was devised. This bolt had a four-sided head, usually with a small sharp point on each corner, and was capable of delivering a tremendous smashing blow to practically any surface, If on occasion the quarrel did not achieve complete penetration, it dealt a blow capable of unhorsing a mounted knight, or of smashing a foot soldier to the ground. The wounds caused by this type of bolt were of a particularly fearsome nature.

The term quarrel is most probably taken from the French 'Carreau', meaning diamond or with square faces. Today when one uses the expression 'to pick a quarrel' we owe it to the medieval crossbowman's choice of a specially sharp or dangerous quarrel for use against a particular enemy.

The most skilful crossbowmen were the Genoese who for centuries were employed by many countries on the Continent as mercenaries and formed the front ranks of the French Army at Crecy in 1346. So feared were they that in 1246, when against the Milanese, each Genoese crossbowman taken prisoner had an eye torn out and an arm cut off in revenge for the Milanese killed by his crossbow.

For many centuries the crossbow was the most popular of weapons for both war and sport until it gradually fell into disuse with the introduction and development of the hand gun, though no doubt exists that the powerful Battle Crossbow of the Sixteenth Century was in many ways a superior weapon to any hand gun of that period and even to many flintlocks, wheel-locks, etc. of later date, it having a greater effective range, accuracy, rate of discharge and killing power. A possible explanation of the crossbow's demise in warfare may be attributed in part to the psychological and morale destroying effect of the early firearms on an adversary completely unprepared for such 'devilish devices' belching forth with great noise, smoke, flame and destruction.

Chapter 2

THE CROSSBOW TODAY

The interest in the types of modern crossbows described in this book is largely due to the formation and existence of the American National Company of Crossbowmen and the American Crossbow Association, who have organised in America competitions based on the archery rounds as shot with the handbow. The N.C.C. are exclusively devoted to

target shooting, with rounds conforming closely to the rounds shot by handbowmen. The A.C.A. also shoot target rounds but include competition with five shot repeating crossbows with a special rapid shooting round. An annual deer hunt is also organised using single shot hunting crossbows, and field shooting rounds with the hunting crossbow are popular.

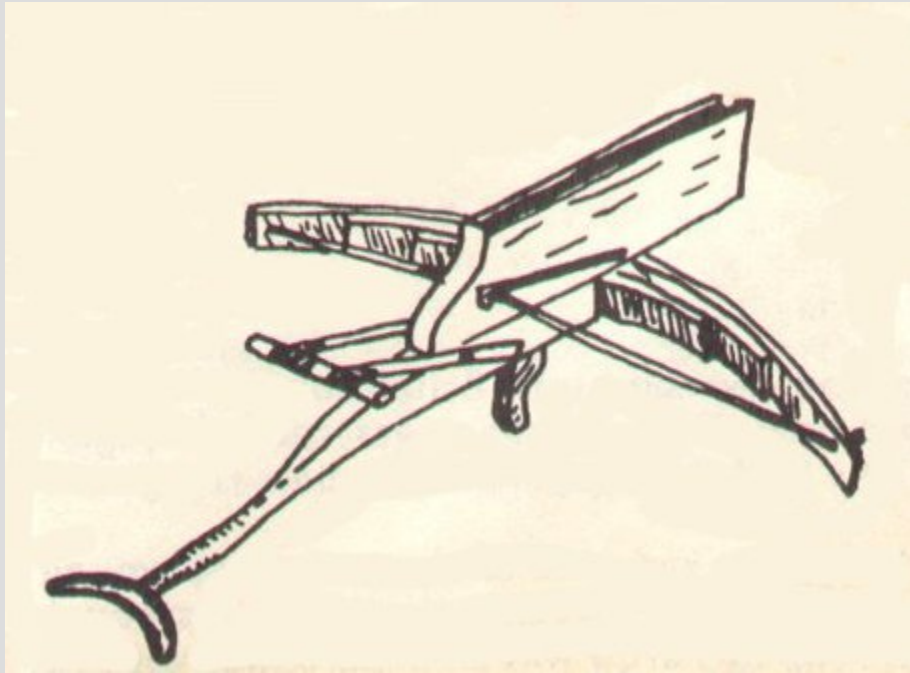
A similar organisation in Britain, known as The British Crossbow Society, has been formed and organises competitions with rules and rounds similar to those of the American N.C.C.

Crossbow shooting had been popular for many centuries on the Continent especially in Belgium, Germany, Switzerland and parts of Holland, where local and regional competitions are held regularly. The crossbows in use are mainly of the lever cocking type, some bolt shooting, others bullet shooting barrelled crossbows.

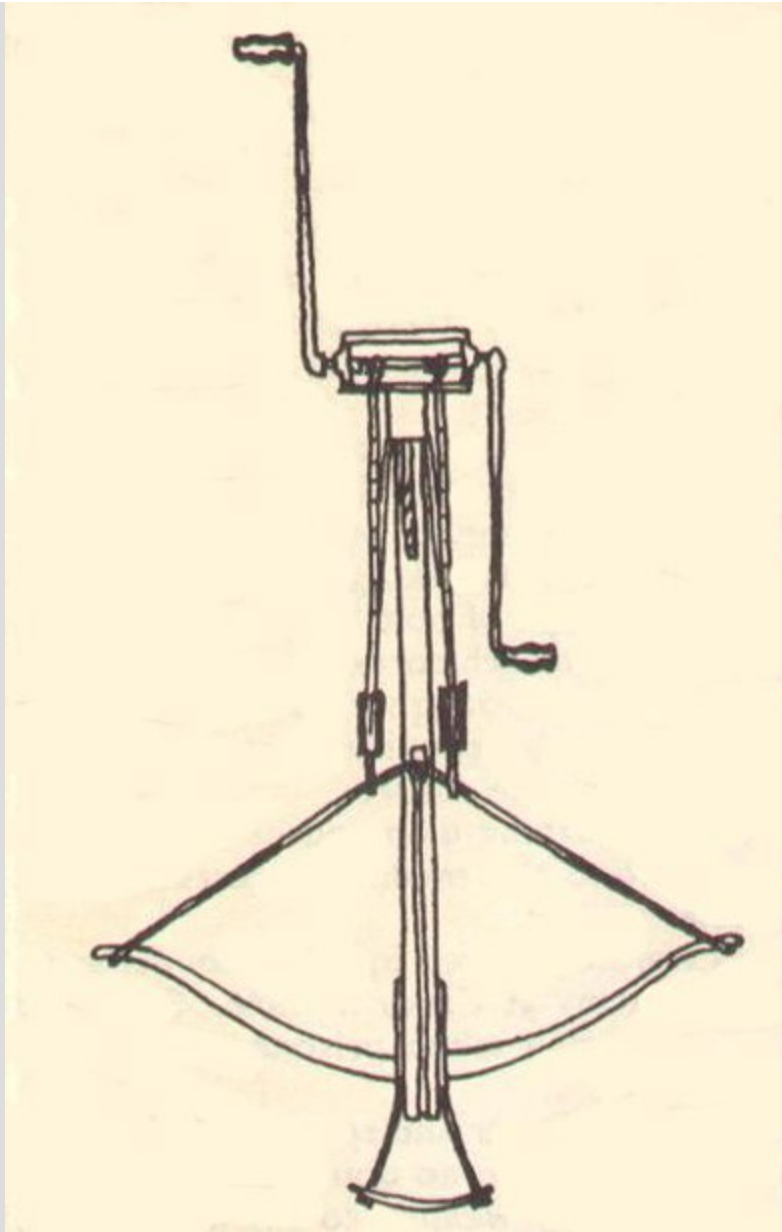
The main form of competition is shooting the popinjay, which consists of a large brightly coloured wooden bird attached to the top of a mast over 100 feet high. Due to the manner in which the popinjay is constructed it breaks away in pieces when struck, each portion of the bird having a certain scoring value. The centre, or heart piece, is the last to fall; the man shooting down the heart, or the last portion of it, is declared the champion. The bullet shooting barrelled crossbow is used in Belgium for the same purpose and discharges a small round metal ball with great force and accuracy. The Belgian popinjay shoot is somewhat different from the one previously described, instead of only one popinjay there are a number of birds, each one having a different scoring value according to its position on the mast. Although shooting at the popinjay is by far the most popular, competitions are also held shooting at conventional circular straw targets.

Shooting the crossbow is very popular in many parts of Switzerland today. The National hero, William Tell, is depicted on Swiss postage stamps complete with crossbow. Other stamps frequently show the crossbow, which is also the trade mark of Swiss manufacture. Due to the expensiveness of the Swiss-made crossbow few men have their own. A club of from twenty to fifty members may boast from between one to three crossbows. In the case of a club possessing only one crossbow, all the members would of necessity shoot in rotation using the same crossbow. This type of crossbow is very heavy, weighing around 35 lbs, with a draw weight of up to 200 lbs, the bow being bent by a lever. All shots are taken from the kneeling position in an indoor range at a distance of 33 yards. Only one bolt is used, each one made to fit a particular crossbow and not interchangeable with others that may be in the club's possession. The bolt used is short and unfletched with a threaded head that screws itself into the target on impact and is removed by simply unscrewing. The target is a wooden board about

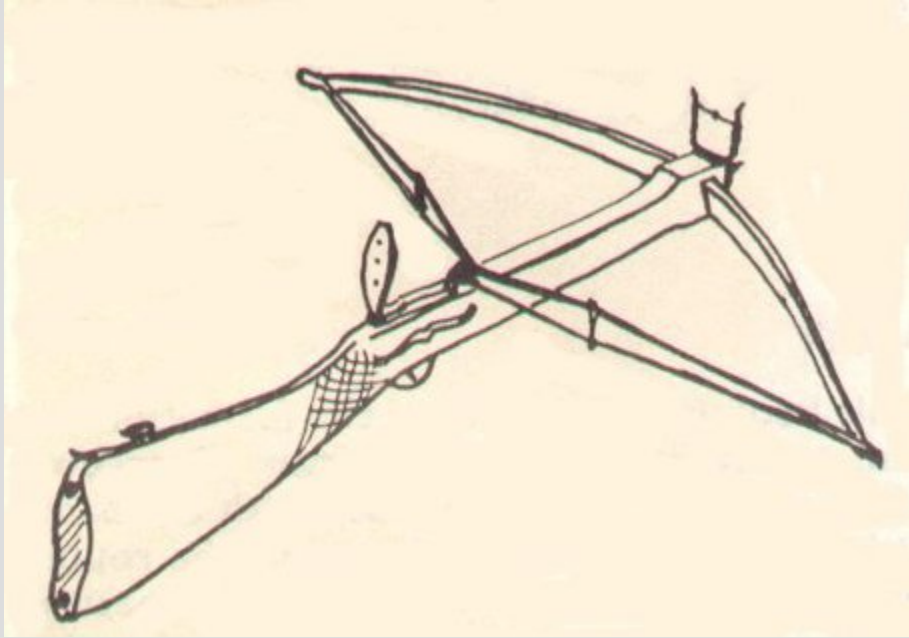
two inches thick with an eight inch diameter face which has nine rings and a centre spot. The centre spot scoring ten and the nine rings scoring from nine for the inner ring, down to one for the outer ring.



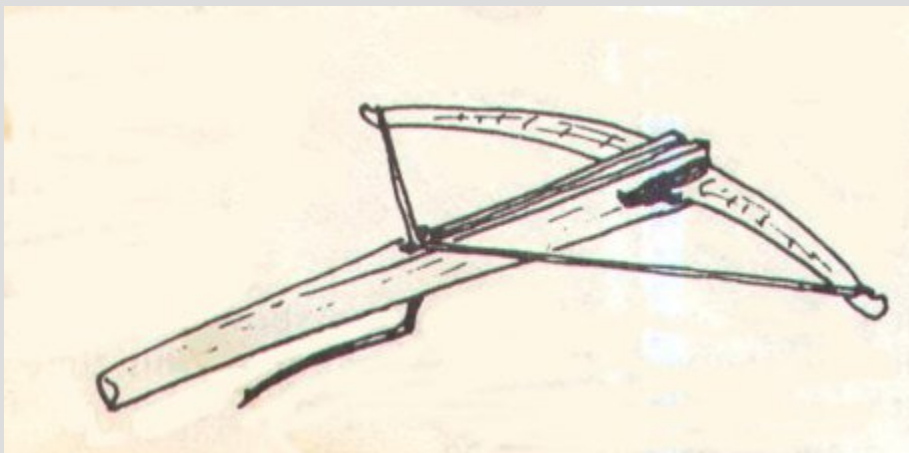
A Chinese repeating crossbow



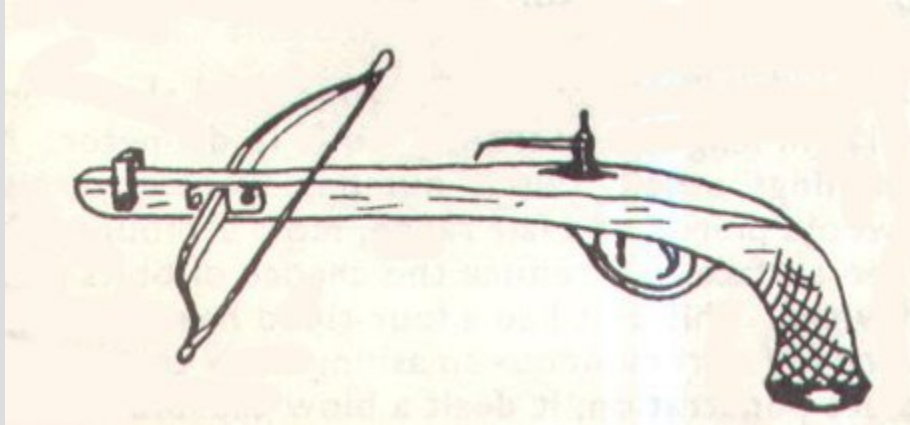
15th century military crossbow with windless attached



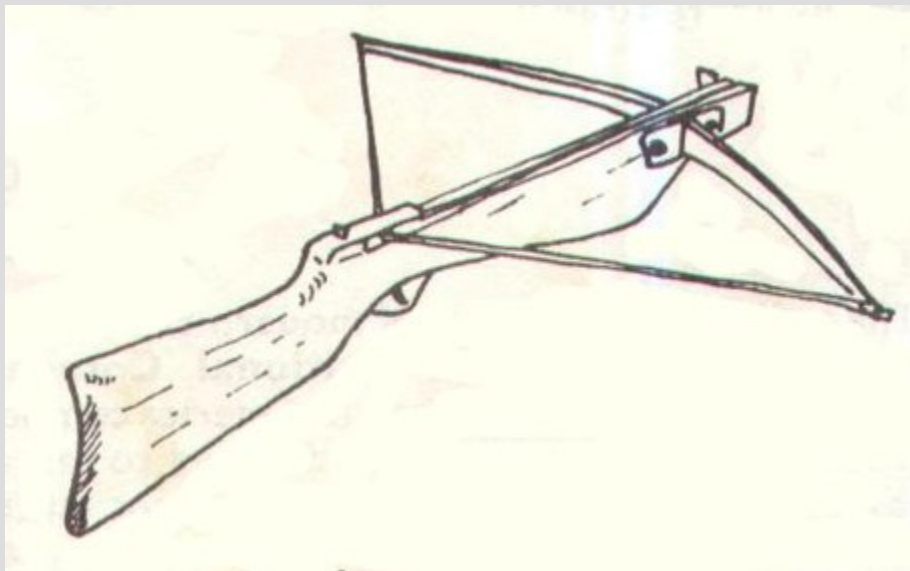
An English bullet-shooting crossbow of about 1810



A 10th century primitive crossbow with a solid wood bow



An Austrian hand crossbow. Early 19th century



A modern hunting crossbow

THE HUNTING CROSSBOW

The crossbows used in Britain and America today are the ones dealt with here and are within the capabilities of a competent handyman to construct, or are reasonably enough priced if you should wish to purchase one commercially.

A crossbow is basically a short powerful bow set transversely at approximately right angles in a rifle type stock, and designed to shoot a short arrow or bolt, utilising the mechanics of the bow for shooting and sights similar to those of a rifle for aiming, the bolt being discharged by mechanical release.

The crossbow's great accuracy at close range, combined with its silent operation, makes it a fine hunting weapon capable of killing various game species and vermin, from the humble rabbit to the stately deer. It may be shot from standing, kneeling, sitting, squatting or lying positions, and may be carried in a drawn position with the bolt in place ready for immediate release; all these factors being an immense advantage over the conventional bow and arrow.

The crossbow's disadvantage in medieval times was its slower rate of discharge compared with the longbow, although this has been greatly exaggerated by historians. The modern crossbow is hand loaded and I personally have discharged an 85 lb. hunting crossbow four times in sixty seconds. This included taking a bolt from the quiver, cocking the weapon, placing the bolt in position, taking fair aim and pressing the trigger. Whether for hunting or target practice, today rapidity of discharge is of no consequence. During a hunt a miss will not, as a rule, permit you a second shot,

your quarry being off before you could reload, and in competitive shooting rapid discharge is not required.

The Hunting or Sporting crossbow weighs usually between five and six lbs. the total stock length being about three feet, with a bow length of from two feet eight to three feet. A hunting crossbow of larger dimensions than this is inclined to be rather too cumbersome in the field for hunting purposes as it tends to obstruct easy movement through the undergrowth.

Hunting crossbows require a sufficient velocity and draw weight combined with as flat a trajectory as possible to shoot the type of bolt suited to kill the game on which they are to be used, and a range and accuracy suited to that special purpose. For example, an 85 lb. to 100 lb. draw weight crossbow is used on large game such as deer, etc. It drives a heavy broadhead bolt at comparatively short range with terrific power. The bolt for hunting small game, being a blunt headed bolt of light weight, is driven with terrific velocity and flatter trajectory to greater ranges by the same crossbow.

A crossbow drawing from sixty to seventy pounds is quite adequate for small game hunting, any poundage much below sixty would not be likely to have the required hitting power to kill humanely enough unless it had extraordinary cast for its weight.

On the whole, it is best to use only draw weights of 60 lb. or over for a hunting crossbow. The best all-round crossbow for hunting game, large or small, will draw between 75-85 lb., my personal preference being an 80 lb. draw weight, as this will kill any game species or animal in Europe or the American Continent.

Despite this fact I frequently receive letters from potential crossbowmen enquiring if I am able to supply a bow to draw from 150 to 200 lb. or more. A flatter trajectory may be obtained with a very heavy draw weight, but it is not always the case. Such a heavy draw weight would require some mechanical device to cock it, adding more weight and encumbrance in the field with the added loss of time to load if an unexpected target suddenly presented itself. A crossbow drawing 75 lb. should kill any animal just as surely as a 150-200 lb. draw weight. Provided your hunting crossbow is accurate, combined with a good cast and fairly flat trajectory, a draw weight of from 75 to 85 lb. is more than sufficient for general hunting purposes.

A hunting crossbow must be as accurate as a target crossbow. The target crossbow's apparently greater accuracy is mainly due to the sights having more adjustment for elevation and windage and all shooting being done at known ranges. The hunting crossbow's accuracy is adversely affected by outside circumstances such as varying shooting positions in the field, causing variations in holding, trigger pressing, etc. It is clear therefore that the potential accuracy of a hunting crossbow must be at least equal to that of a target crossbow.

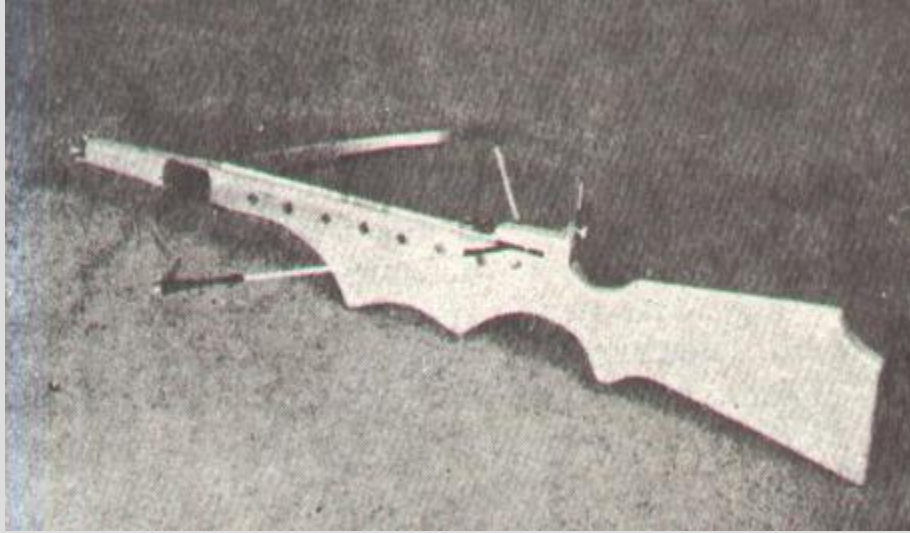
Chapter 4

HOW TO CHOOSE YOUR CROSSBOW

A crossbow may seldom, if ever, be used efficiently for both hunting and competitive target shooting, each type differing in individual features that are applicable to their own particular purpose.

Target crossbows are required for practice and competition, killing power is not necessary, the one and only absolute essential is accuracy to enable the crossbow to attain the highest score possible. The entire design, construction and mechanics of the weapon in every detail are devoted entirely to that single purpose.

Many varied and unusual designs are seen on target crossbows and, to the uninitiated, may appear weird if the comparison taken is from a rifle. Many crossbows made by amateur enthusiasts, and sad to relate some commercial makers, look very much like rifles in design, an obvious lack of knowledge of good design together with a desire to streamline for appearance being the cause. What seems to be forgotten is that a crossbow is not a rifle, will not shoot like a rifle, and due to the high bolt trajectory, in comparison with that of a rifle bullet, calls for an entirely different approach to design. By a combination of experiment, trial and error, shooting, designing and making crossbows for a number of years, I found that my designs were gradually falling into a certain constructional pattern that had basic principles essential to a properly designed crossbow whether it was for target practice or hunting. These principles of design may only be disregarded at the expense of the crossbow's potential accuracy and power.



A modern target crossbow designed by the author

Stocks

The essential property of a good crossbow stock wood lies in its non-warping properties, and being of hard enough composition to withstand the inevitable knock or so it will receive.

Many hardwoods are eminently suitable for stock construction having a straight grain and a density able to withstand knocks and bumps; however, some are too light in colour for hunting stocks, beech, oak. etc., and rather heavy when made into a stock. Others are rather difficult to work, mahogany for example: besides being a little soft in composition it has a slight tendency to tear during planing operations.

The following hardwoods are among the best for stock construction, being of straight grain, medium to hard composition, easy to work, and polishing up beautifully. The

best of all woods I consider to be walnut, French walnut preferably; failing that English or African walnut. Mansonia is also a fine stock wood with an exceptionally beautiful grain and colour. My third choice is sapele, a beautiful reddish hardwood with an appealing striped grain. Sapele is known in the trade as a bastard mahogany, and although I do not generally recommend mahogany for crossbow stocks, sapele is an exception, not being a true mahogany it is of a rather harder texture and exceptionally attractive when polished.

Many of the light coloured woods of heavy weight, such as Japanese oak and beech, are ideal for laminated barrels on a darker stock such as walnut. For a complete stock it is best to avoid these woods if you are able to obtain a darker coloured wood of light to medium weight.

Barrels

Crossbow designs are numerous and no one particular design will suit every crossbowman perfectly. However, basic principles of good design never vary and the following should be taken into consideration when purchasing or constructing a crossbow. The bolt shooting crossbow, in the true sense of the word, does not have a barrel, but simply a straight groove running from the start of the latch recess to the extreme fore-end of the stock along which the bolt will fly with one feather down the slot. This slot or groove should be half an inch deep by one eighth, or a maximum of three-sixteenths of an inch wide, as smooth as glass and perfectly straight. The bolt groove should be chamfered only sufficiently to lay the bolt on; the bolt must lie on and not in the bolt slot as any unnecessary depth of chamfer causes undue friction on the bolt, resulting in drag, this in turn

affecting the cast of the bolt and also accuracy to some extent.

Most crossbow barrels are self, that is, the complete stock is entirely of the one wood. Others have laminated barrels of a particularly good non-warping hardwood either glued to or bolted through the stock.

Perhaps the best barrel is of metal, either alloy or brass, consisting of angle guides screwed to either side of the stock along the full length of the bolt slot. This type of barrel will ensure perfect accuracy under all weather conditions, metal not being subject to the slight warping that may be likely to occur in a wooden barrel. Metal barrels are less liable to accidental damage than wood, and if they are accidentally dented the angle guides may easily be replaced.

The bow string bearing down on the barrel is responsible for a great loss of cast when shooting and this must be reduced. This reduction or partial elimination of friction may be obtained by having the barrel as narrow as possible. A self wood or laminated barrel should be rounded off one quarter of an inch each side of the bolt groove, and a metal angle strip barrel should be kept to the minimum width.

Fore-ends

The fore-end of the stock, where the left hand grips, should provide a steady firm hold at the correct distance forward to suit the individual. As the average stock thickness of a modern crossbow is only one inch I find it best to build up the fore-end to a thickness of about two inches to provide a firm hold.

This may be built up by glueing two half inch thick lengths of hardwood to each side of the stock at the fore-end. By rounding off after gluing, a 'Beavertail' fore-end will be obtained. You may prefer a deep swelled fore-end designed to keep your fingers below barrel level to prevent them being hit by the bowstring -- incidentally, a most painful experience.

Some crossbows have pistol type forehand grips, similar in style and position to those seen on tommy guns, and related weapons that were intended to be shot from the hip. This type of grip is best left on these weapons and should never be used on a crossbow, unless it is positioned just forward of the trigger a few inches to enable the crossbow to be shot using the hip rest technique described later in this book. The ones I have in mind have the grip too far forward for hip rest shooting and should at once be discarded as quite useless. In all good shooting the left, or supporting, elbow should be as well under the stock as is comfortable, and certainly not out to the side. This is impossible to accomplish with a pistol hand foregrip, as the actual method of holding makes the elbow push up and out to the left which is entirely wrong, resulting in an unsteady and weak position.

If using the hip rest shooting position, the fore-end grip in this case will not actually be at the fore-end of the stock as we know it but in fact only a few inches in front of the trigger. However, as we are dealing here with the types of forehand grips on crossbows, and this is gripped by the left or forward hand, it is essential to mention this type of grip for those who may prefer it, and for target shooting it is a favourite of mine, though on a hunting crossbow my preference is for the orthodox forehand grip. The hip rest forehand grip must be in a suitable position forward of the trigger to fit the left elbow firmly and comfortably into the

correct position for hip rest shooting, by either gripping or cradling it in the palm of the left hand.

A pistol grip designed for hip rest shooting would be suitable if placed sufficiently close to the trigger to be used in this position, or alternatively a deep stock at this position to rest on the hand. Perhaps the best idea is an adjustable rod with a ball at its base to slide up or down in the stock as required when shooting at various ranges. This ball is cradled in the palm of the left hand and, with the elbow in position on the hip, is ideal for steady shooting.

Butts

Crossbow butts, whether hunting or target design, must have the comb of a sufficient height to rest the cheek, or at least the jaw on, if it is to be of any use.

As the stock is elevated to shoot at long ranges, the butt comb must be high enough to contact the cheek or jaw as the butt is moved down the shoulder. A steady and invariable pressure of the face, jaw or cheek, on the butt is an essential to good shooting. A butt comb height suitable for shooting at range of 30 yards will be too low for 70 or 100 yards unless the comb height were adjustable, and I do know of at least two target crossbows with adjustable combs. The difference in height would be slight in a well designed butt, and it is impossible to have a fixed butt perfect for every elevation. Due to the higher trajectory of a target crossbow employing a light draw weight and the longer ranges shot, the comb is of necessity higher than that of a hunting crossbow of flatter trajectory, and heavier draw weight that is designed to be shot at closer ranges.

A good guide to butt comb height is to have the comb on a hunting crossbow level with the top of the barrel, or very slightly below it. As a rule target crossbows combs are higher than the barrel line to allow the cheek to be rested for the higher trajectory shots.

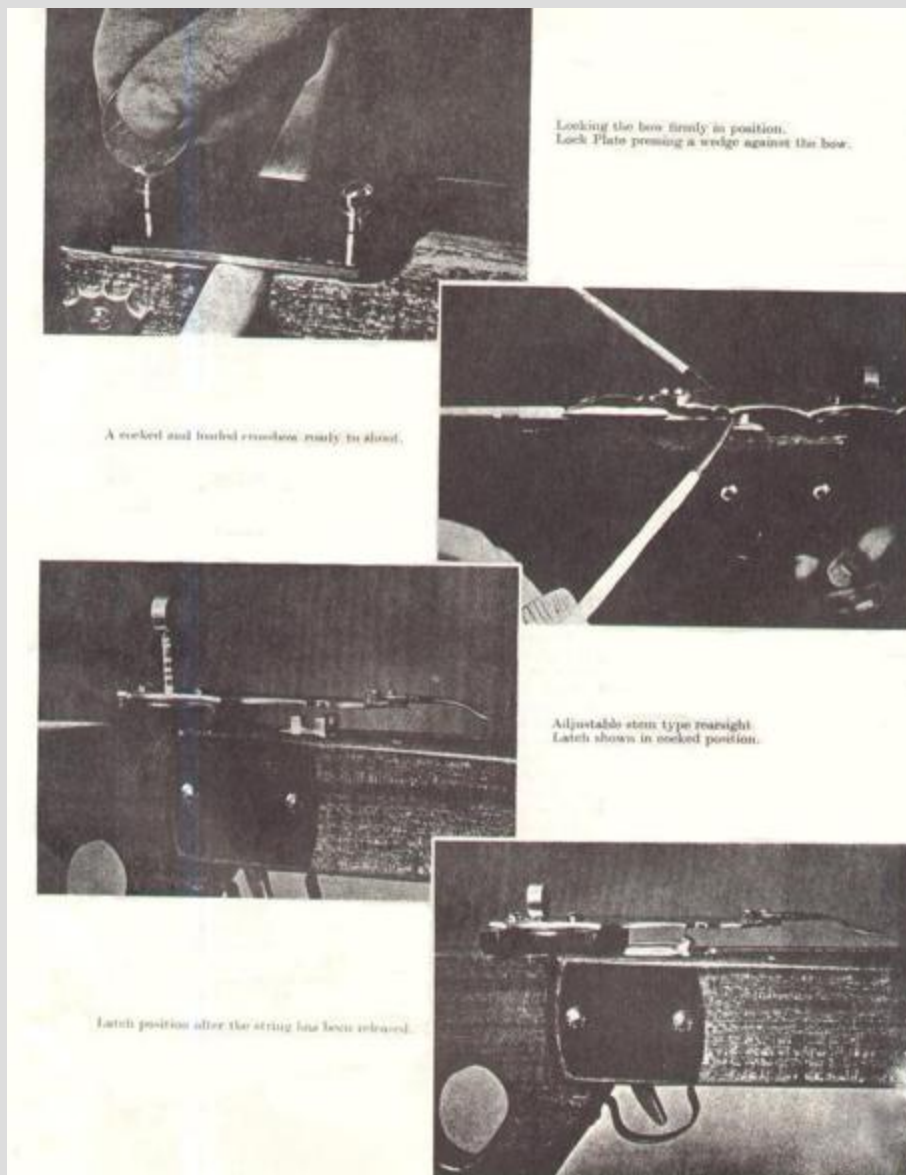
The butt should not in any way be curved to fit the shoulder, it should have a slight slope to enable the butt to be moved up or down the shoulder as desired to maintain contact throughout its full length. A curved butt being moved down would mean that only the fullest part of the curve would contact the shoulder with resultant unsteadiness when shooting.

The butt length is measured from the centre of the trigger to the toe of the butt, an average being fourteen to fourteen and a half inches, though this will of course vary according to the individual. It should, however, be able to be raised to the shooting positions without having to be pulled in too much, or pushed out. If too short, a cramped bunched-up hold will result, and if too long, a strained position will be felt.

Do remember that the draw length of the bow added to the length of the butt from latch to butt plate must be of a length to enable you to comfortably reach forward to the string when the butt is against your abdomen prior to drawing back the string.

For instance, if you had a long target bow drawing twenty inches, with a butt length of fourteen inches, giving in all a total distance of thirty-four inches from butt plate to where the bow is fitted into the stock. A small man, lady, or youth may experience difficulty in comfortably reaching for the string; therefore this factor should be taken into consideration when constructing a crossbow, although it is

only likely to arise with a target crossbow employing a long bow.



Hand

The rear or right-hand grip on a crossbow is known as the hand. The best hand grip is of the pistol type in which the portion gripped by the fingers is nearly vertical. This enables the trigger to be squeezed and controlled in the most natural position, the elbow of the right arm is also held in the best position for steady shooting with this type of grip. The full pistol hand is mainly seen on target crossbows, with a half- or semi-pistol grip on hunting crossbows. Whatever type of hand is used it must be comfortable, and as far as possible fashioned to provide an unvariable hold. An increasingly popular hand grip on crossbows is the thumbhole type. This hand grip is incorporated as a part of the butt itself, the thumb being placed through a shaped hole allowing three fingers around the grip, the index finger on the trigger.

Sights

Rear sights on crossbows are of two main types, peep sights and vee sights. The peep type is best used for target shooting and the vee sight for hunting, as this sight gives a clear view of the animal rather than one spot on its body. A low, wide vee is preferable to a high, narrow one for the same reason. All rear sights must have some method of elevation, and in the case of a hunting crossbow it is best to have this adjustment easily and swiftly made. I believe in having a maximum of three different elevations for hunting purposes in units of one quarter of an inch. This simplifies rapid choice of elevation under hunting conditions, with the 1/4" adjustments showing an appreciable increase in range.

I have used with success an immensely simple, though effective, hunting sight requiring no manual elevation; yet

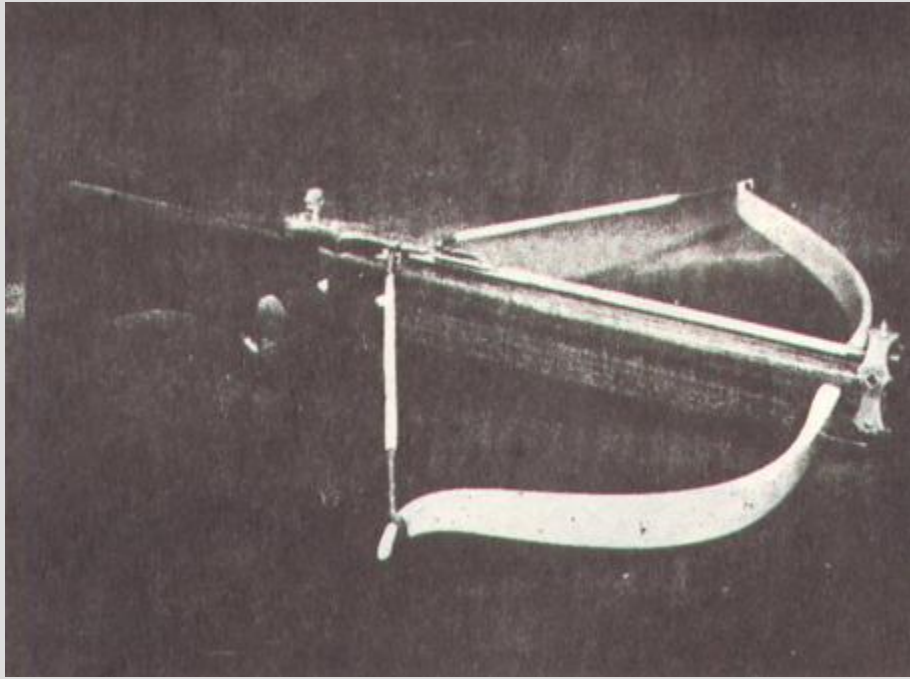
with an instantaneous selection of two ranges, 30 yards and 50 yards. This sight consists of a fixed double aperture rear sight with a peep hole set $\frac{1}{8}$ " above the level of the foresight bead, for sighting at up to 30 yards; above this peephole is a 'V' notch sight for sighting at 50 yards. To change elevation instantaneously from one range to the other, without having to look away from the quarry, (an invaluable asset), one simply transfers the eye from the peep sight to the vee sight, or vice versa as required.

The stark simplicity of a fixed double aperture sight requires a certain amount of estimation of the distances between 30 and 50 yards in placing the foresight bead in such a position on the quarry so as to compensate for the lack of a particular sighting elevation.

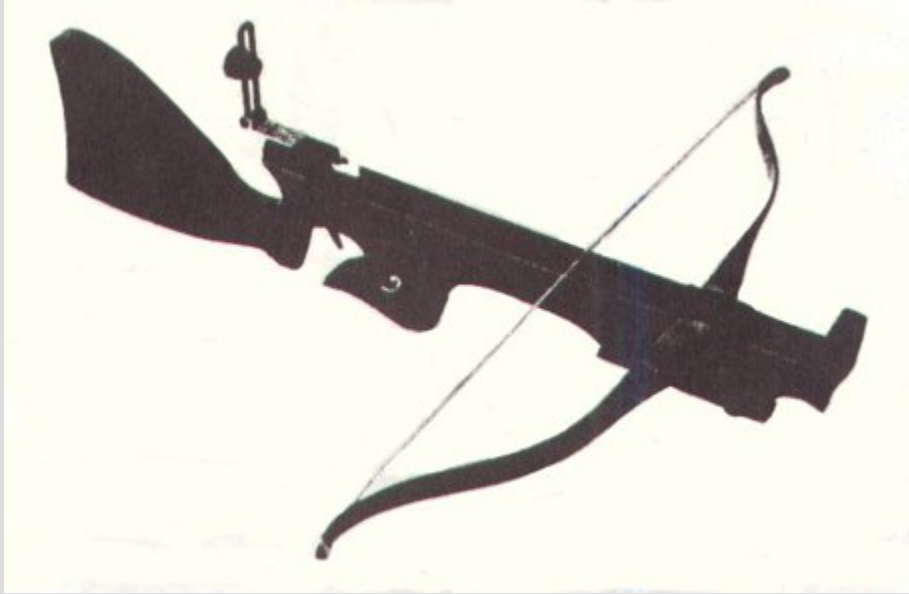
For example, if you estimated a deer to be at 40 yards, you would sight through the bottom peep hole placing the beadsight on the heart and lungs area, but you are at 40 yards, so raise your bead up until it is sighting half way up the body. This should compensate sufficiently to place the bolt in the heart and lungs area.

As an alternative, it would be possible to use the 'V' notch sight and compensate by aiming lower on the quarry. Two snags occur doing this; first of all if aiming lower on the vital area of a deer one has invariably no sight whatsoever on the body, the bead coming under the body. It is better to retain a point of aim on the quarry itself, even if high up, than be aiming at a patch of earth somewhere below it. The other point is that you are liable to become confused if you vary your technique. sometimes using peep sight at 40 yards and aiming higher, or sometimes using the notch sight and aiming lower. The simpler you are able to keep your technique the better. Keep to two fixed sights only. Do not attempt this method using three or even four rear apertures

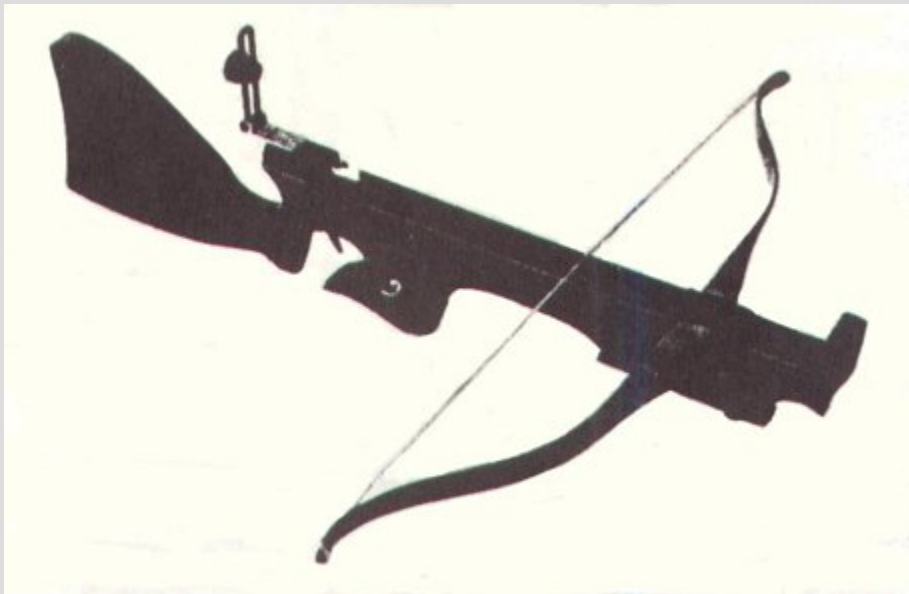
in an attempt to have a sight for three or four distances, as under hunting conditions you may select the wrong one.



A hunting crossbow with fibreglas bow.



A Target crossbow with composite bow.



Stringing the crossbow. (The author's method.)

Target crossbows should also have a lateral adjustment to allow for windage; this is usually in the form of a sliding bead on the foresight bar, but is sometimes seen as a lateral adjustment on the rear sights. The unit of vertical adjustment on target crossbow rear sights is in units of one-eighths of an inch, as this finer increase is required for extremely precise shooting.

Hunting crossbows have the rear sight only adjustable and this for elevation only as no windage adjustment is either necessary or desirable, though some lateral adjustment on the foresight is advisable for 'zeroing' purposes. Some hunting crossbows are constructed without sights, the crossbowman simply aims along the bolt at his quarry. This method has no advantage over the crossbow with sights as it reduces shots at the longer ranges to mere guesswork.

A crossbow without sights may be considered by some as more sporting, but is it sporting to risk maiming an animal due to having no definite idea as to which spot your bolt will strike?

The rear sight should be placed sufficiently far forward from the eye to be looked through naturally when aimed with the sight at its lowest elevation. Any tendency to pull the head back to focus results in a cramped position of the head and neck; if the head has to be pushed forward this will cause a tense, strained hold that will adversely affect your shooting.

If you have a crossbow in your possession try this experiment to ascertain if your rear sight is correctly positioned. Take up your crossbow with the rear sight set at lowest elevation and assume your usual position to shoot with *both* eyes closed. Place your cheek along the butt until you are perfectly comfortable and in the position you feel is correct. Now open your right eye to look through the rear

sight. Surprised? Were you completely out of focus and had to move your head back or forward along the butt to take proper aim? If so, the remedy is to adjust your sight either closer to or farther away from your eye as much as will enable you to conduct the sighting experiment *without* having to move your head. The use of a six-hole aperture peep sight on a target crossbow will enable you to select the aperture best suited to the prevalent light conditions on any particular day and to adjust the aperture size to suit changing light conditions.

A popular sighting arrangement on American target crossbows is the offset type. The front sight bead is offset 1/4" to the side of the bolt slot centre with the rear aperture sight offset in line with it. This method requires the lateral windage adjustment to be on the rear sight as the front sight bead is an immovable fixture.

With this particular sighting arrangement it is not necessary to elevate the stock as much at the longer ranges as would be necessary if the foresight were on a bridge of the usual type an inch or so above the stock, and the offset of 1/4" is so slight that its effect on accuracy may be disregarded as it in no way has any adverse effect. The same effect is obtained by a stock with the extreme fore-end dropped below barrel level with sights 1/4" *below* the flight of the bolt. This also will not require as high a butt comb and is ideal for a target crossbow, but is not suitable on a hunting model as no point blank sight may be taken due to the foresight being *below* barrel level and the rear sight above the barrel.

The hunting crossbow's fore sight and rear sight when in position on the stock must be mounted exactly in line with each other and at *exactly* the same height from the barrel. An alternative method is to place the hunting rear sight at

its lowest elevation from one-sixteenth to a maximum of one-eighth of an inch higher than the fore sight. This gives a slightly rising flight to the bolt up to about thirty yards.

Do not be tempted to raise the rear sight more than one-eighth of an inch above the fore sight or you will find that from point blank range to about twenty yards your bolts will strike anything from one inch to twelve inches above the spot you aimed at.

Whether you use this principle, or prefer both rear sight and fore sight at exactly the same height, do not on any account place the rear sight even a fraction lower than the fore sight as this will cause your bolts to have a slightly downward flight, striking at the short distances inches below your point of aim, and at the longer distances your bolts will 'nosedive' even yards in front of the point of aim.

The rear sight may be on a slightly higher elevation than the fore sight, or exactly on a level with it, but never at any time even a fraction of an inch below it.

Release Latches and Triggers

The action of the latch upon release is to drop below barrel level into the latch recess and so release the string along the barrel to drive the bolt from the stock.

When experimenting with various release latches and triggers made from widely varied materials: fibre alloy, brass, wood with metal insets, steel, etc., it became obvious that the only safe release mechanism material is case hardened steel; or at least steel with the contact points of trigger and latch case hardened. The use of other softer

materials only leads to undue wear on the release mechanism which may become dangerous.

As the metal wears in non-steel mechanisms at the contact points this gradually alters trigger pull off until your bow may discharge at the slightest touch. If constructing your own crossbow, a steel latch and trigger does call for a lot of hard work with hacksaw and file working to fine limits; any error calls for the lot to be scrapped and once again the tedious job of hand shaping steel. This I feel is the reason so many amateur enthusiasts use softer materials, they are simply easier to work with, but they are not the best. A case hardened steel latch and trigger will stand up well to many months of regular shooting with perfect safety.

The surfaces of the trigger and latch in contact with each other should be as short as safety will allow and in perfect contact with each other throughout their entire width, with the general latch workmanship of a first class nature.

A safe positive lock when in the cocked position is essential; a cocked and loaded crossbow that may suddenly slip off contact and shoot its bolt is a most dangerous weapon.

While experimenting with various release mechanisms this has on occasion happened to me, and though no damage to property or injury to anyone was caused, it is a most unnerving experience and will cause apprehension whenever your crossbow is cocked. It is essential to have every confidence in the holding ability of the latch mechanism. The latch should cock easily and be safe to the point of holding even under moderate shock, such as being dropped.

The trigger action must be smooth and effortless no matter what draw weight your bow is, and the latch must have a

rapid drop with no tendency to return to the cocked position after shooting. Triggers with first and second pressures are an asset, particularly on a target crossbow. Irrespective of action the latch should be slotted to allow the rear end of the bolt through to contact the bowstring prior to release. The width necessary will ensure a correct string angle around the latch forks for an accurate release. I have seen some string release latches as narrow as 1/4" and of course, due to the narrowness, unslotted, the bolt being placed directly in front of the latch. Apart from the fact that the bowstring wears out very quickly on this narrow type of latch due to the pinched angle of the string around it, accuracy is certain to be reduced due to the bolt not being in contact with the string prior to release, it receiving a fast hit from the string rather than the fast smooth 'push' it would receive on a slotted latch.

The inner faces of the release latch forks where the string is held must be as smooth as glass to prevent wear on the bowstring. Most latches inner faces are slightly curved to take the string in the cocked position, as on a completely vertical latch fork there may be the tendency for the string to slide up and off, causing a premature release. I must confess that I prefer a vertical latch fork with the latch cover designed to prevent the string slipping off, though this is purely a personal preference.

The trigger pull must be consistent and may be anything between 3 lb. to as much as 8 lb. Although a pull-off of 5 lb. is average and desirable, it is by no means essential. What is essential is that the pull off is consistently the same. Pull-off adjustments are made possible on some crossbows by means of an adjusting screw, and are most desirable on target crossbows.

It is possible, though not ideal, to shoot well with a very heavy pull off weighing, say 8 lb., provided it consistently pulls 8 lb. at every shot. A trigger that pulls varying weights from shot to shot, due to wear at contact points or loose pivots, will never give good scores.

The pivot pins through trigger and latch must be steel, and strong enough at the latch to take the pull of the bowstring without bending. At the same time they should be as snug a fit as possible while still working easily enough to allow smooth action. Any looseness, especially on the latch pivot, has considerable effect in variation of trigger pull.

Practically all crossbows are constructed with the pivot pins passing transversely through the stock from side to side, the ends being flush with the stock and retained in position by cover plates of hardwood or metal screwed to the stock. If it is required to examine the trigger group, these plates are unscrewed and the pivot pins pushed out. An alternative and neater method is to have the trigger group and pivots contained in a light metal four-sided box to slip into the latch recess. This shows no pins or cover plates and is very neat and strong, keeping the latch recess without pivot holes through the body of the stock.

The draw weight of your bow has only slight effect on trigger pull off if the correct angles are obtained between trigger and latch contact faces and the pivots are correctly placed to give proper leverage. It should be as easy to discharge a 100 lb. draw weight as it would be a 50 lb. draw weight.

A number of ingenious release mechanisms have been devised over many centuries, though the original 'nut' type, or free revolving rolling block latch was not improved on for 400 years, and then only by a rather more complex mechanism of a double trigger, three springs and two

moving parts. The free revolving or rolling block latch was held in a fitted metal casing, this casing was a close fit on both sides and bottom of the latch. A retaining pin was inserted through the centre of the latch to prevent the latch falling out of its casing. This pin was purely a retaining pin and *not* a pivot. The latch pivoted in its metal casing and no strain whatsoever was placed on the pin. This type of release was used during centuries of crossbow construction, and was capable of holding with safety and discharging with a smooth accurate release, powerful battle crossbows drawing up to half a ton.

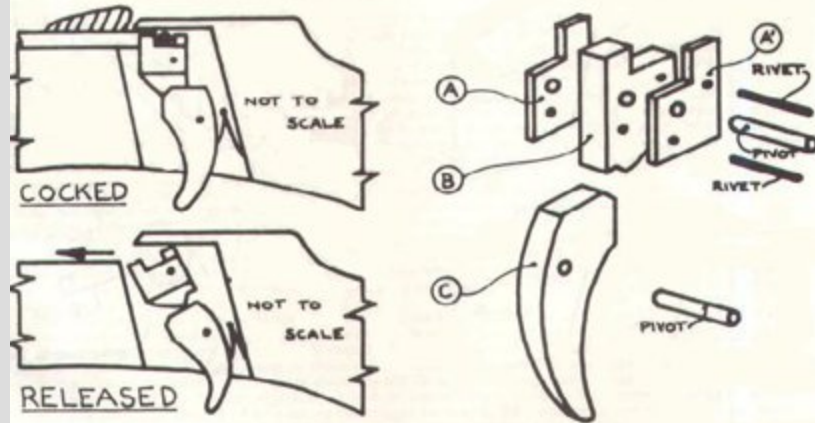
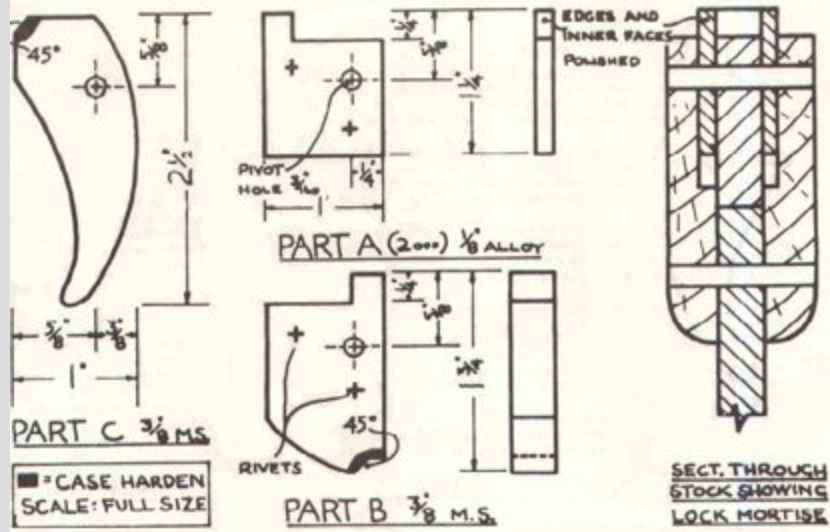
For simplicity, accuracy and safety, the free revolving latch, as described, is probably the best for any crossbow in use today whether for hunting or target use. The most common cause of a dry release on an otherwise well designed and constructed latch, particularly among the heavy draw weight hunting crossbows, is due to the bending of the latch pivot. No such occurrence is possible utilising a free revolving latch as no pressure whatsoever is placed on the pin.

The majority of modern crossbows use some variation or adaptation of the latch described. The basic design is retained regarding the actual method of release, etc., and the following variations are common to simplify construction and to create a self-cocking latch. The latch pivots on a steel pin of suitable strength, and a cocking projection is added to the rear of the latch. The long medieval 'trigger' is replaced with a conventional trigger.

The improved release mechanism devised during the 16th century, incorporating a double trigger, was most advantageous from the safety point of view, and for its exceptionally fast release, it was impossible for this latch to release the bowstring accidentally, as it would not discharge

until the safety trigger was set, this being done immediately prior to release. Upon pressing the release trigger the locking device struck the latch lever a sharp blow knocking it free of the latch and thus allowed the latch to drop, releasing the bowstring. This latch was cocked in the conventional manner by the bowstring, and once cocked would not release until the rear trigger was set and the front trigger pressed.

The simplest, safest and most accurate releases for the amateur to construct are the two following types; both adaptations of medieval releases, and both, for ease in making, of fabricated construction. For the purpose of readily identifying the mechanisms I propose to refer to one as the stonebow release and the other as the *nut release*.



FABRICATED TRIGGER MECHANISM II DESIGNED BY T. STUBBS
DRAWN BY J. A. HODGE

Both types of release may be cut from solid steel if desired, though if the amateur feels this is a little beyond his capabilities, my method of fabricated latch construction is as efficient and strong as one of solid construction. Both the stonebow and nut release are suitable for any modern crossbow up to 100 lb. draw weight. Over 100 lb. draw weight I recommend the use of the rolling block release as used in medieval crossbows with the retention of a modern trigger in place of the trip lever device.

The mechanism shown on the opposite page (p.12.jpg) is a modern adaptation of the release used in medieval stonebows. This type of mechanism has an extremely high safety factor due to the 'hook' construction of the trigger contact point. This 'hook' makes it virtually impossible for the latch to drop accidentally, as any forward pull on the latch engages the hook more firmly into the sear pin. This can only be released by pressing the trigger; and so pivoting the hook forward and off the pin. The cocked and released positions, as shown in the diagram, illustrates this admirably.

A helical spring attached to the lower front section of Part B and the centre front section of the trigger, Part C, does the work of trigger spring and also acts as a foolproof non-return spring, preventing the latch bouncing up again to the cocked position after release; a fault found in some mechanisms. An efficient latch of this type may be easily constructed using the fabricated method. Three pieces of light alloy make up the mechanism. Two pieces shaped as Part A and one only piece shaped as Part B. All three parts drilled through and riveted together complete the latch. The sear pin on which the trigger hook holds must be of steel and, when in position through the rear of the latch, perfectly horizontal. The sear pin should be cut long enough to allow riveting into position.

The Trigger, Part C, is made entirely of steel with the hook surface, where it will bear on the latch sear pin, case hardened. It is a simple matter to make this latch with a 'second pressure' on the trigger, as is found on many first class rifles. To do so all that is required is to pass the edge of a file across the underside of the trigger hook at one eighth of an inch in from the hook tip. Use enough pressure only to cause a narrow indentation. This slight indentation is quite distinctly felt through the trigger as a 'second pressure', indicating that the trigger has but a further eighth of an inch to travel before release. To return the trigger to first pressure, and safe, is accomplished by pushing the trigger forward. The indentation across the trigger hook face must not be too deep, or wide, or it will defeat its own purpose. Use only the edge of the file, going no deeper than one sixteenth of an inch. Do remember that if you decide to have a second pressure on your trigger, the trigger hook must be case hardened *after* the indentation has been filed.

We come now to the nut release as used in one variation or another in most modern crossbows in use today.

This mechanism may also be easily and efficiently constructed using the fabricated method. A latch of this type is quite simply made by the following method. Three pieces of flat bar metal strip are used, two pieces of light alloy (A) and one of mild steel (B). After cutting to shape and drilling through, the three pieces are laminated together with two small steel rivets. The centre laminate of steel (B), later case hardened, forms the contact point of the latch at the trigger (C). The two alloy pieces, riveted each side of the steel laminate, act as latch forks to allow the butt end of the bolt through to contact the bowstring. The spring for this latch is made from a piece of clock or old lock spring screwed to the stock inside the back of the trigger recess.

When bent over the spring presses against the rear of the trigger to provide resistance when the trigger is pressed. The general principles of good latch and trigger construction as outlined earlier in this chapter are of paramount importance and should be carefully observed. When this type of latch is used it is most important to ensure that the correct angles are obtained between the latch and trigger faces and that the pivots are precisely positioned. If the trigger is heavy and jerky to discharge, particularly during the last part of the pull, it is invariably due to the latch being forced up and back when the trigger is pressed. The trigger face pushing the latch up throws the entire draw weight of the bow on the trigger causing a heavy pull off.

A fault of this nature in the release mechanism is due to incorrect angles between latch and trigger faces, which may be caused by badly placed pivots or incorrect contact angles between latch and trigger.

To locate the pivot positions and contact angles accurately it is advisable to cut a stiff cardboard template of the stock over where the mechanism should fit. Mark the pivot holes on the template and try the latch and trigger against it, in both cocked and released positions, so as to determine accurate positioning. When satisfied, mark the pivot positions, using the template on the stock when drilling the pivot holes.

The latch cover is in the form of a hardwood or metal bridge passing directly over the latch and screwed firmly into the stock behind the latch recess. This cover allows the string to pass under, protecting the trigger and latch from dust and rain. This cover is also used to attach a bolt clip to grip the rear end of the bolt prior to release, enabling the crossbow to be pointed vertically up or down without the bolt falling out.

Bows

We come now to the source of power that shoots the bolt from the stock, the bow. Provided attention has been paid to the bow's fitting, angle to the stock, and height in stock, the power and speed with which a crossbow bow will throw a particular bolt depends on how fast the limbs return from the bent to normal positions. The speed at which they return depends on bow design, stiffness of the limbs and how far the limbs are bent. The choice of bows is numerous as regards material. You may have self wood, composite, solid fibre glass, spring steel or alloy. The choice is yours. Bear in mind that you will seldom have the required cast and power in a self wood bow for hunting purposes. A self wood bow will generally shoot sweetly but not fast or with a very flat trajectory, and will also tend to 'tire' over a day's shooting, and may not be carried at full draw for long periods. A composite bow is probably the best, even though a little expensive. Steel bows are good if they have no tendency to kick, but are much heavier in the stock than other types.

Solid fibre glass is used in the U.S.A. with some success, but apparently is not readily obtainable in Britain. I find solid fibre glass bows to be robust, reliable, showing good cast, and are of moderate price. These bows must inevitably be purchased from commercial sources as their construction is beyond the capabilities of the amateur craftsman.

Alloy bows are light in weight, easy to construct or cheap to purchase, and have good cast for their weight. This is contrary to an opinion once passed by an archery authority as being poor in cast.

One of my hunting crossbows with an alloy bow drawing 85 lb. threw an ordinary target bolt 390 yards. I am in no doubt that with a flight bolt I could have reached the 400 yard mark with ease.

A noticeable advantage of an alloy bow is its ability to be carried at full draw for long periods without loss of cast. Non-ferrous alloys will not last indefinitely as bows, and should be discarded and replaced after some 2,000 to 3,000 shots. Alloy bows are so cheap to construct that replacement is not as financially disastrous as may be thought.

Although this alloy shows good cast, some controversy exists concerning its safety factor, as sudden breakages have been experienced with this material. Any flexed bow that breaks is dangerous both to the shooter and bystander, and every precaution should be observed to avoid such an occurrence. Alloy bows must be of such a finish that no scratches or unevenness is apparent at any point whatsoever. Over a period of eight years I have experienced only two breakages in bows of this material, both occurring on cocking the crossbow, the bow limb breaking off close against the stock at the bow plate. These breakages I put down to the bow design allowing too much flexion at this point. After adjusting the design to stiffen the bow centre at the stock and allowing more flexion along the bow limb to the bow tips, no further breakages were experienced.

There is no such thing as an unbreakable bow whether it be self alloy, steel, solid fibre glass or composite. Flex a bow enough times and it will eventually break. It may take many thousands of flexes over a period of some years to do so, but no bow will last for ever. Some handbow manufacturers deliberately break bows in a machine that repeatedly flexes the bow limbs many thousands of times, (this is to ascertain

the average life of the bow), and so are able to guarantee their bow for a period of one to three years at the most.

A fine piece of tough rubber glued on the back and belly of an alloy bow at the centre section, where the bow is in contact with the stock and bowplates, helps to absorb recoil and provides a resilient surface for the bow limb to pull against. This is a considerable help in reducing the possibility of a premature breakage of the bow limb close to the stock. As an alternative material, fine leather makes a good substitute if rubber is not available.

Should an alloy bow snap off at the bowplate close to the stock it could be dangerous, as a flying bow limb could cause a nasty cut. To prevent an accident of this nature, safety stops fitted to the stock will effectively prevent the bow limb flying back at you, and are simply fitted by the following method.

The bow plates on my crossbows are 1/8" thick mild steel with a 1/4" diameter hole either side of the bow slot. These plates are clamped firmly to the stock by 1/4" diameter screwed rods passed through the bowplates, and the stock itself, and tightened up with four hexagonal nuts. Should a safety stop be required, simply leave the screwed rod behind the bow limb long enough to protrude 2-1/2" to 3" out from the side of the stock. Firmly clamped against the bowplates, these protrusions will effectively deflect to the side any bow limb breaking off at the stock. Leave the other hole and screwed rod in front of the bow limb clamped tight against the stock in the usual way as no protruding rod is required in front of the bow.

A composite bow is by far the best for either target or hunting crossbows, having usually excellent cast. You may expect to pay considerably more for a good composite bow

than for any other type, though the extra cost is well worth the advantages you will have over the other types.

Velocity or speed of cast depends mainly on bow design and draw length. A flat trajectory is dependent on velocity; the higher the velocity the flatter the trajectory. A high or low trajectory on a target crossbow when shooting at regulation ranges is of no real consequence, whereas on a hunting crossbow as flat a trajectory as possible is essential. A bow with recurve tips will throw a bolt with faster cast than a straight-ended bow because when drawn the recurve unbends and upon release acts as a spring giving extra 'snap' to the limbs.

The shorter the bow the greater will be the cast for a given draw length. Although a longer bow will shoot more steadily and smoothly, it lacks the cast of the shorter bow. A bow of three feet, drawing sixteen inches, will shoot faster than a bow of three feet six inches, drawing the same weight at sixteen inches, but the shorter bow will not shoot as steadily.

Crossbow bows are practically identical to flight bows and when drawn form almost a true ellipse between bow and string. The farther you draw your string back to form an ellipse the faster cast your bow will have. The danger is in trying to force the bow to have too long a draw for its length causing it to break. As a long bow shoots steadily it is best for target work, while the shorter bow throwing its bolt flatter will be more useful for hunting purposes. A flat trajectory reduces your difficulty in range estimation, increases hitting velocity at the longer ranges; all this adding up to increased effective hunting ranges.

Irrespective of draw weight, the recoil or 'kick' on a crossbow when shot should be practically negligible or entirely non-existent. The absence of recoil will depend a great deal on

stock construction and weight in relation to bow design and the manner in which the bow is fitted to the stock. The principle of good bow fitting is to have the bow immovably fixed in the stock. This must at least efficiently prevent any lateral or vertical movement of the bow. A number of crossbow bows are fitted into rubber mountings in such a manner as to prevent any movement other than the natural forward and backward movement when shot. This rubber mounting will effectively absorb recoil.

All bows should be mounted at 5° to vertical in the stock as this angle gives the fairest pull on the limbs. Over 5° gives a faster loose but may tend to twist the bow limbs. Your bow should be fitted into the stock as close to the bolt groove as safety will allow, as this will assist the string in a fast loose. The bolt groove, being 1/2" deep, will allow the bow to be fitted with its top edge 1/8" below the groove, in all a total of 5/8" below barrel level. This, together with the bow fitted at 5° to vertical, reduces the pressure of the string bearing down along the barrel. The higher in the stock your bow is fitted the better the cast your bow will have.

Many self wood and composite bows have a 1/4" deep cut out at centre to barrel thickness, this further reducing friction by raising the bow limbs a further quarter of an inch when fitted to the crossbow stock.

The best Sixteenth Century crossbows, and some of later date, were fitted with a canted limb steel bow, fitted in the stock at right angles. String movement along the barrel was absolutely friction-free, the canted limbs allowing the string to skim fractionally above the barrel delivering every ounce of draw weight to the bolt.

Canted bow limbs do not, to date, appear to have been utilised in modern bow construction, though I consider solid

fibre glass a likely possibility for this.

Stock Weights

A fairly heavy stock of from 7-8 lb. I feel is an advantage in a target crossbow, being easier to control than a light one, especially on a windy day, as even a slight breeze has considerable effect on the crossbow. For practical hunting purposes a lighter stock is best as it is not so fatiguing to carry around all day when out on a hunt. A difference of even 1 or 2 lb. in weight makes itself known at the end of the day.

The balance of your crossbow stock is well worthy of consideration as two stocks of identical weight may well feel entirely different according to the point of balance; and a well balanced stock is more comfortable to shoot with. The best point of balance is not perhaps as you may think just ahead of the trigger, but lies at about the centre of the stock between your hands. Should your stock be butt heavy it is possible to throw weight forward by drilling a large hole under the butt plate and hollowing the butt out. The hole should then be plugged with hardwood to match, or covered with a butt plate.

If your target crossbow is heavy you will most certainly shoot better from the hip rest position than in the usual off hand standing position where the extra weight would soon tire you and greatly affect your accuracy, so if your target crossbow is in excess of 8 lb. be sure it is equipped to be shot from the hip rest position.

The American market some years ago was flooded with various commercially made crossbows of poor design and poorer performance, making extravagant claims in an attempt to cash in on the rapidly growing crossbow interest. Modern crossbow design in Britain has not reached the point where one may buy with confidence an unseen, untried weapon. There are exceptions of course, but how is the novice to know for certain that he is purchasing an efficiently designed crossbow?

It is not entirely satisfactory to make your purchase even from some famous name archery firms. One internationally known handbow manufacturer, now producing crossbows, manufactures a weapon of exceptional beauty and poorly designed release mechanism! Another well known firm claim their crossbows to shoot a distance well in excess of the present official world record for crossbow flight shooting! It is wise therefore to purchase a crossbow only from reliable firms, or a good amateur maker of known repute whose claims may be truly justified, bearing in mind the construction principles referred to in this section before making a choice of crossbow. Better still, do not purchase an unseen, untested crossbow from anyone.

Chapter 5

PRACTICAL SHOOTING

All crossbow shots in present day competitions are taken from the offhand position. This term 'offhand' means exactly what it implies; the crossbow is shot off the hands without resting the weapon on any support other than one's own body. No definite set style can be laid down as being best for

all crossbowmen. However, certain basic principles do exist and are essential to good shooting.

Firstly, the body must be balanced steadily and firmly on the feet, and the body turned approximately half right to target, with the greater portion of the body weight above the forward foot and not on the rear foot. This forward weight distribution must on no account be exaggerated to the extent of tipping forward on to the toes. What to aim for is to 'feel' a firm steady balanced position on the flat of the feet, with the weight a trifle forward. Any tendency to throw the body weight over the rear foot will result in an unsteady 'slouching' stance.

Now raise the crossbow to the shoulder, the butt firm against the shoulder though not pulled in tight, the left hand supporting the stock at the fore-end well down at the base of the hand and not perched on the finger-tips. The right elbow must be well up and out to the side, the bent arm being parallel with the ground, this being the best position for the shoulder to receive the butt to hold the crossbow steady. Do not tilt the stock at an angle when shooting; your bow at all times should remain horizontal.

The offhand standing position is by far the unsteadyest shooting position of all. However, it is the only one used in competition and so must be mastered. It is impossible to hold aim exactly on the centre of the gold for more than a fraction of a second and it is at that precise moment your bolt must be released if it is to find its mark. During aiming your sight will tend to wander about the gold in a most alarming manner, and your first instinct will probably be to pull the trigger sharply immediately your sights touch the gold. This must be avoided at all costs as it causes one to 'snatch' shots off.



Aiming from the offhand position

Certainly the ideal would be to raise the crossbow to the shoulder, take aim, and the first instant the sights rest exactly centre, squeeze the trigger. Unfortunately shooting from the offhand position is not quite as simple as this; by no means take over long when aiming before squeezing the trigger as this will only add to the difficulties by tiring the

eyes and hold, and you will probably squeeze your shot off in desperation, ending more unsteady than you were to begin with. In a nutshell, take the shortest time possible to ensure a good aim. Gradually control the waver of your sight on the gold, and for that fraction of a second that it rests exactly on centre, tighten your finger on the trigger. As your sight wavers off keep the trigger finger pressure as it is, but pull no further. As your sight comes on again once more tighten a little on the trigger. Eventually you will be on target with your final squeeze as the trigger releases and your bolt should strike its mark. This may sound a lengthy process, but indeed occupies only a few seconds.

When aiming, you should look through the rear aperture sight at the foresight bead, which should appear exactly in the centre of the aperture and in line with your point of aim, your point of aim being the gold.

It is impossible for the eye to focus clearly on three different points at exactly the same moment with equal clarity, so let us eliminate one of these points, the rearsight aperture. Look *through* the aperture not at it, with the foresight bead on the gold.

You should now be looking through the aperture at the foresight bead in line with the gold, but not directly at the gold. This method of concentrating your vision on one main point, the foresight bead, will enable you to place this bead clearly defined on a slightly hazy gold as you look at it through a slightly hazy aperture. By trying to focus two or three points simultaneously all you will accomplish is strained eyes and nerves, resulting in poor scores.

Pressing your trigger is perhaps the most vital moment when shooting. With your sights on target and your hold perfect, all that remains to be done is to press the trigger to release

the bolt on its way to the gold, yet it is during this simple physical movement of bending the index finger that you are most likely to transmit some of the movement your finger will make to your hand and cause movement of the stock. The movement of bending the finger to release the trigger is simple, but to bend this finger only, without any other slight hand movement is abominably difficult and may never be fully perfected. What must be striven for is that *only* the trigger finger must move without imparting movement to the rest of the stock, or altering the hold of the other three fingers and thumb. Good trigger pressing practice may be had without actually shooting bolts by cocking the latch (do not cock the bow itself) taking aim and trying to control the trigger finger's movement. This 'dry' practice is also invaluable as an aid to controlling sight 'waver'.

After the trigger has been pressed and your bolt starts to leave the stock, it is imperative to hold exactly the same after trigger release as it was during release. After release you have the difficulty of your finger pulling against the spring only, as against a 4-5 lb. pressure of the bow when cocked. If you do not allow for this sudden change in pressure, your stock will move during release with adverse effect to your bolt's flight.

Continue your aim after the bolt is shot and declare your shot to yourself before lowering your crossbow, and prior to your bolt striking the target. Declare to yourself where you think it will strike, that being the place your sights were at the exact moment of release, not where you hope it will, the gold of course; you will know where your sights were at the instant of release, and that may not be where they ought to have been. If not on the gold, why did that shot go out? Misses can only be accounted for by lots of shooting experience. It may lie in your hold, position, trigger pressing, flinching, etc. It is up to yourself to keep striving for

perfection, and by constant practice and experiment eliminate any fault or faults you may have. To know of a certain fault in your shooting technique is half way towards correcting it, and to shoot well with the crossbow is a matter of good, consistent style and practice, practice and more practice, together with an efficient crossbow of good design and suitable bolts. The standard of accuracy attainable under these circumstances will depend finally on the individual's temperament and concentration.

To shoot accurately with the crossbow your bolts must form a good group, falling close together on the target when shot in the same manner. The closer the group the more accurate the crossbow. Groups will be closer at the close ranges than the longer ranges due to the fact that your bolt, if deviating slightly from centre when shot, will be much further out when it strikes at 100 yards than it would be at 50 yards.

Let us assume that if the crossbow is shot from an immovable rest in exactly the same manner for each shot, the perfect ultimate group would be for every bolt to fall directly on top of its predecessor. If this were possible it could not be called a group. However, the fact that no crossbow possesses perfect accuracy, and no set of bolts is exactly alike, causes the bolts to spread out from the central point of aim to form a group. The same crossbow, using the same bolts and shot by a crossbowman under exactly the same conditions, will not shoot as close a group as that shot from an immovable rest, due to the human error involved in not being able to hold, aim and shoot the weapon without the slightest alteration for each shot.

A crossbow shows good accuracy if it will group consistently. No matter where on the target they group, the sights may be adjusted to bring the group within the gold; the main thing is to ensure your bolts do group and not shoot a wide and

varying pattern for each end shot. If your bolts are widely scattered over the target face either your crossbow, your bolts, or your shooting, is at fault, it's up to you to determine which. If attention has been paid to the earlier chapter on design and construction, and your shooting style is good, it is most probable that the fault is with your bolts. The professional method of group testing a crossbow is to shoot it from an immovable rest at an indoor range, using the same bolt for each of six shots. Ideally the bolt will shoot into the same hole each time.

Assuming you have neither an immovable rest nor indoor range it is still essential to test your crossbow's accuracy before commencing field or target shooting, and no doubt it will be necessary to zero the sights to suit the individual. At a *measured* range (not paced) of 25 yards, set up your target and adjust your crossbow sights with the rear sight at its lowest position and the front sight bead as exactly central as you are able to gauge.

Aim at the centre of the gold for every shot and shoot six bolts at the gold in the same manner with the sights unchanged for any of the six shots. If your group is low, move forward a few yards and once again shoot six bolts. If your bolts group in, or on a level with the gold, you will be able to measure your crossbow's flat trajectory, that being the range at which your crossbow will shoot a particular bolt without having to elevate your sights. It may be that your trajectory at 25 yards is flat, if so move back a few yards to shoot another group until you can ascertain what range your bolts group at before dropping below the point of aim, which is the gold, and is necessary to raise your sights.

The next requirement is to adjust your lateral sight to move your group into the gold, if it is not already there. All that is required here is to move your foresight to the side your bolts

are grouping to bring them into the gold. If your bolts are grouped to the right of the gold, move your sight to the right. If they are grouped to the left move your sight to the left.

To group well it is necessary to aim every bolt at the gold irrespective of where on the target they strike, then from where the entire group is you will be able to adjust your sights to group all your shots within the gold. Do not attempt to correct on each single bolt; correcting on single shots is a waste of time. Shoot six bolts and correct on the group as a whole; this applies to shooting on a windy day, judge the effect of the wind on the entire group. If particularly heavier gusts of wind occur, try to shoot between these gusts if at all possible but without rushing your shots to beat the wind. It is far better to shoot in good, relaxed style irrespective of wind than to worry about when the next gust may come along, and snatch the trigger off.

The hip-rest technique is a very good position from which to shoot the crossbow, and is particularly suited to competitive target shooting where one would tire rapidly in shooting dozens of bolts from the standard offhand position. The stance in relation to the positions of the feet and body are identical to that of the previously described standard position with the hold and position of the right hand and arm also the same. The left elbow is placed firmly on the left hip just above the joint and below the ribs, the stock supported by the finger-tips and thumb just in front of the right hand; or if using a palm ball rest, the ball of this rest is cradled in the palm of the hand. This position firmly locks the stock to the body in a similar manner to which a rifleman would use a sling. Strictly speaking the hip-rest position is also shooting 'offhand' as the weapon is not rested on or supported by anything other than the body, and is permissible in competition.



Aiming from the hip-rest position

Chapter 6

HUNTING WITH THE CROSSBOW

The crossbowman of the Middle Ages was greatly esteemed, especially in Spain, where some of the finest crossbows were made. The following extract translated from a manuscript on

field sports written in Spain by Alonzo Martinez Del Espinar in 1644 may well show that the crossbowman was considered the true hunter and sportsman of his day.

Only those sportsmen are called *ballesteros* (crossbowmen) who hunt every kind of game. The ballesteros hunt the stag and deer on horseback; they know how to stalk and they know the tracks and habits of all wild animals and where they may be killed. The ballesteros make hunting parties for every kind of animal and they know the haunts and habits of each one, according to its nature, and everything that belongs to the craft of forestry and hunting.

The crossbow when used for hunting is the weapon of the true sportsman, the stalker, the hunter in every sense of the word. The man with the shotgun knows little of stalking. He walks up to his game using the superior senses of his dog to flush it out and dispatches his quarry with a spread of shot. With the crossbow you will hunt alone and in silence, seek out your quarry, stalk it within range of a clean shot, and dispatch it silently with a single bolt. For every animal a man shoots with the rifle there are ten you won't even get close enough to for a shot with the crossbow. Your stalking skill will be your thrill, with the kill being proof of your ability to outwit the superior senses of your quarry. A close miss at 20 yards with the crossbow is a greater thrill than a kill at 100 yards with a rifle.

The crossbow is not the weapon of wholesale destruction, and to succeed with it for hunting calls for a knowledge of the animal you are hunting, where they may be found, and at what times. A haphazard stroll through unfamiliar country in the hope of a shot at anything that may come along is largely a waste of time. The passage quoted from the Spanish writer of 1644 applies to this day. Know your game, its habits, its haunts, and develop skill at stalking. Then and

only then will you be assured of regular kills with the crossbow.

To make the most practical use of your crossbow under hunting conditions it is essential to know your weapon's potential as to range, trajectory, etc., with the particular types and weights of bolts to be used, and to be an accurate judge of what range your game is at. Due to the high trajectory of a crossbow bolt (in comparison with a rifle bullet) the majority of killing shots will be made within the flat trajectory range of up to about 30 yards. At ranges greater than 30 yards your sights would have to be raised; thus, if you estimate your quarry at 50 yards, raise your sights accordingly and shoot well, you will hit your target. If, however, your range estimation was from 10 to 5 yards out either way, your bolt will strike either behind or in front of your target. This shows the desirability of a hunting crossbow to have the flattest trajectory possible.

The accurate estimation of ranges cannot be too strongly stressed and, believe it or not, without practice, the average person is unable to tell the difference between 75 yards and 100 yards, particularly over rough country. The hunting crossbowman will only suffer bitter disappointment unless he is able accurately to estimate ranges over varying terrain. The answer lies in two things, practice at range estimation and a system.

The British Army teaches a good system of range estimation that comes surprisingly close and is known as 'bracketing'. You see your game and estimate what range you think is just too much, then estimate the range you think would be just too short. Add the total of both ranges and divide by two. For example, you see a rabbit and calculate it at no further than 60 yards at the most, and certainly no closer than 40 yards. Now add both ranges together. This makes a total of 100

yards which divided by two is 50 yards. Set your sights at 50 yards. take a shot and if you do not score a hit you will be surprised how close you were. With practice at this system you can expect a large number of kills provided your aim is good.

The average distance at which you are likely to shoot the greatest number of bolts under hunting conditions is about twenty-five to thirty yards and practice shooting at this distance in particular will be invaluable. My favourite hunting crossbow has only two sighting elevations, adjustable for thirty and fifty yards; my system is that if I can't get within fifty yards of my quarry I don't shoot. If my range estimation places me between two of the ranges my sights are adjustable to, say perhaps 35 or 45 yards, I select the nearer sighting elevation to the range estimated and place my point of aim either slightly higher or lower as required to compensate.

Experiment with various lengths and weights of bolts to ascertain which type will shoot from your crossbow with the best effect with regard to the one that gives the flattest trajectory combined with hitting power and accuracy. It is important to know exactly what distance your crossbow will shoot with the sights at the various elevations using a particular bolt, and to estimate those ranges accurately, bearing in mind the unavoidable differences in performance and range of small game bolts and the heavier broadhead bolt. A very light bolt will leave the stock with exceptional speed but after a certain distance is more easily slowed down by air resistance due to its lack of weight. A heavier bolt, while not having the same initial cast, will shoot a further distance and strike a harder blow at long range. This does not apply to heavy broadhead bolts but to the differences in performance between a heavy and a light small game bolt.

A solid grounding of target practice with your hunting crossbow, with the added practice of shooting from sitting, kneeling, squatting and lying position, will be an essential preliminary to hunting.

Your next step will be field shooting at targets on the ground at varying unmeasured distances to develop your ability at range estimation; these also shot at from varying positions. Field targets may be old cardboard boxes, stuffed with paper with a black spot painted on the sides to aim at, or for a bit more realism, paper animal target faces may be purchased quite cheaply. Excellent field practice may be obtained with a pocketful of balloons, especially if a slight breeze is evident, as this will cause the balloons to drift along the ground for practice at moving targets. Do use targets of this type that will not be rough on your bolts. Good bolts are not cheap, and shooting at tin cans, bottles and similar objects only ruins your bolts, and broken glass littered around is dangerous to cattle and people alike. You will have just as much fun and practice with softer targets and still be able to use your bolts again.

Use blunt-headed bolts for field practice as these are not so inclined to bury themselves out of sight in the earth, as target bolts have the nasty habit of doing. After retrieving your bolt, and before placing it back in the quiver, examine the head for any ragged edge where in contact with the barrel, due perhaps to striking a stone, etc., If damaged, do not shoot that particular bolt, as the rough metal surface will tear strips off a wood barrel and leave score marks along a metal one.

To shoot a bird on the wing with a crossbow calls for an enormous amount of skill and is usually only practicable on the slower flying birds like crows, rooks, etc. Shooting at

flying birds may mean the loss of many bolts in the event of misses, an expensive miss at that.

A good, cheap substitute for bird bolts is a 5" length of arrow dowelling fitted with a blunt head only, and having no fletching. This reduces your cost to a few pence as a 30" long arrow dowel will give you six lengths and only heads are required to be fitted. Usually these bolts are considered expendable, though the slight extra cost of cresting the full length of the shaft with fluorescent paint has enabled me to recover many of these 'expendable' bolts. I find orange is the best colour for the shaft. With so short and unfletched a bolt you will not expect great accuracy at long ranges; however, up to about 40 yards this bolt is accurate and will leave the crossbow with exceptional speed and has sufficient power to kill within that range.

If you are able to obtain gas-filled balloons and attach these to a string, you will find this good practice for shooting flying birds. If you intend hunting larger game such as deer, etc., you must do your field practice with broadhead bolts.

Some people simply use a special bolt with a type of pile similar to a target bolt, but the same weight as their hunting broadheads, as this prevents damage to the blades. My personal preference is practice with the actual broadheads themselves, as you cannot guarantee that a bolt with a pile head will perform exactly the same as your broadhead bolts with their very much larger head surface, even if they are the same weight.

The broadhead bolt is for use on large game only and should be selected for maximum cutting power and penetration, as the broad head kills by haemorrhage, severing the large arteries and blood vessels. The greater the penetration combined with maximum cutting surface, the more certainty

of severing more vital arteries and bringing a speedy, humane death. The broadhead bolt has remarkable penetrative powers, and you may expect the majority of bolts striking big game to pass completely through the animal, and in many instances even if striking the bone. A broadhead bolt has no shock effect such as that delivered by a bullet, so you must not expect your game when hit by a broadhead to drop on the spot unless you deliver a heart or neck shot. Your game may travel from 10 yards from where it was hit to miles if a non-fatal shot, so aim your shots carefully. A lung or heart shot will quickly drop it within a few yards. If you only wound your quarry it is your sole responsibility to find and dispatch it as quickly as possible.

A well designed broadhead will leave a good blood trail that should be easy to follow, if you ever find it necessary to trail your game. Broadheads are wasted on small game, rabbits and the like. A rabbit penetrated through the body by a broadhead will somehow manage to make it to the burrow where it is irretrievable and will die miserably, whereas a blunt-headed bolt will kill it instantly by shock no matter where on its body it is struck, though do aim for a head or shoulder hit in preference to anywhere else. This also applies to target bolts with their sharp pile points; they have the nasty habit of disappearing deep in the earth, having great penetration, and should be reserved for use only on regulation targets which are designed to stop that type of bolt. Each type of head has its own particular use and is best employed for that use.

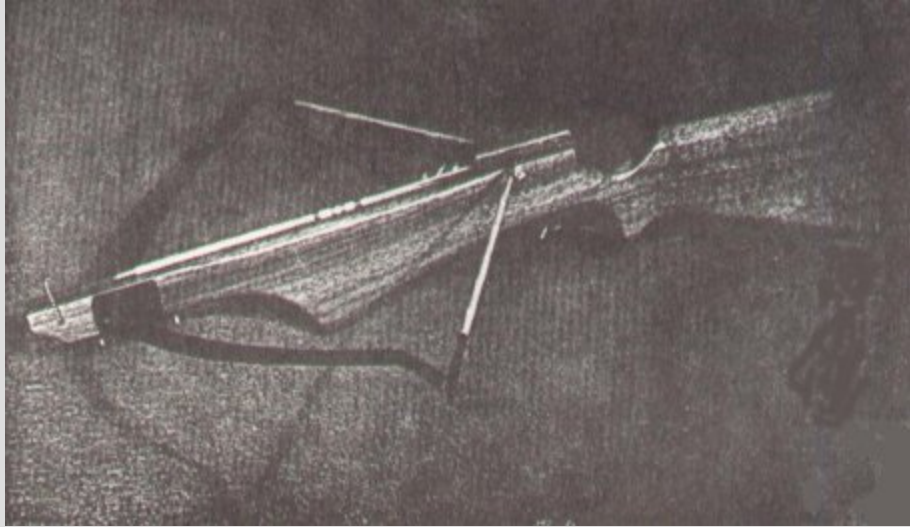
There is practically no creature on the face of the earth that cannot be killed by the crossbow bolt. Game large or small will all fall to the crossbow -- deer, cougar, antelope, elk, foxes, rabbits, crows, etc. The largest species in Britain are deer and it is possible to hunt for them in various parts of the country. Apart from various game birds and animals

there are the creatures classed as vermin or pests that practically any farmer or landowner will be pleased to allow you to hunt for, in particular crows and squirrels that cause incalculable damage to crops. Neither of the last two mentioned are easy game and it will take all your hunting skill to show a successful bag.

The entire contents of this book could easily be filled with the many varied and interesting phases of crossbow hunting, and in fact many excellent books on bow hunting are available on the market and though not devoted specifically to the crossbow, the information will be of untold value to the hunting crossbowman with practically every aspect applying to hunting with the crossbow, and the reader will find it to his profit to study these books.



Loading a Hunting Crossbow



A Hunting Crossbow with steel bow

Chapter 7

RANGES

Often I am asked what range one may expect from their hunting crossbow. It will naturally vary considerably, according to design and the other factors mentioned in earlier chapters. As an average, you may expect the range of a good hunting crossbow shooting a normal target or small game blunt bolt at an angle of 45° to be over 300 yards with a range in excess of 200 with the heavier broadhead bolt. The effective hunting range is probably not more than 100 yards at the very most, yet your bolt would kill at over 300 yards if it hit its mark. Why is the range limited? The reason lies in the abovementioned phrase 'if it hit its mark'. You will not hit with certainty at much over 100 yards and therefore will not risk the loss of a bolt, or a maiming, non-

fatal shot by shooting. Another reason is the high trajectory at 100 yards and over. A rifle's flat trajectory will enable you to shoot at an animal that may show itself behind the overhanging branches of a tree at 80 yards, knowing that your bullet's trajectory will only be about 1/2" high at that distance. With the crossbow, your bolt's trajectory at that range may be from 18 inches to 2 feet, perhaps causing your bolt to strike the overhanging branch you are aiming below.

The average 'point blank', or flat trajectory range of a crossbow shooting an average weight 15" long target bolt or small game blunt is approximately 25 yards. This is the distance at which the bolt will follow a perfectly straight path before its velocity is slowed down by gravity and air resistance, resulting in it following a slightly downward curving flight. From this it will be seen that to hit a mark over 25 yards away it will be necessary to aim to some degree above the mark for the bolt to follow its curving, path downward to strike the mark. As a crossbow with fixed sights would only be accurate up to flat trajectory range it is necessary to use vertically adjustable sights to shoot accurately over this distance. By using an adjustable sight to aim at longer ranges the stock will be elevated above the mark to be hit. Sights are simply an accurate method of elevating the stock by a required amount; keeping one's sights on a fixed mark or point of aim. The rear sight, when elevated and looked through at the foresight in line with the target, causes the required amount of stock elevation to shoot the bolt in its curving flight to strike the target at a particular distance.

In observing the range limitations of the modern crossbow I should make clear that a well designed hunting crossbow, shooting its optimum weight bolt, will shoot with accuracy at ranges very much on a parallel with those of a shotgun, the most effective hunting ranges being up to 40 yards, at

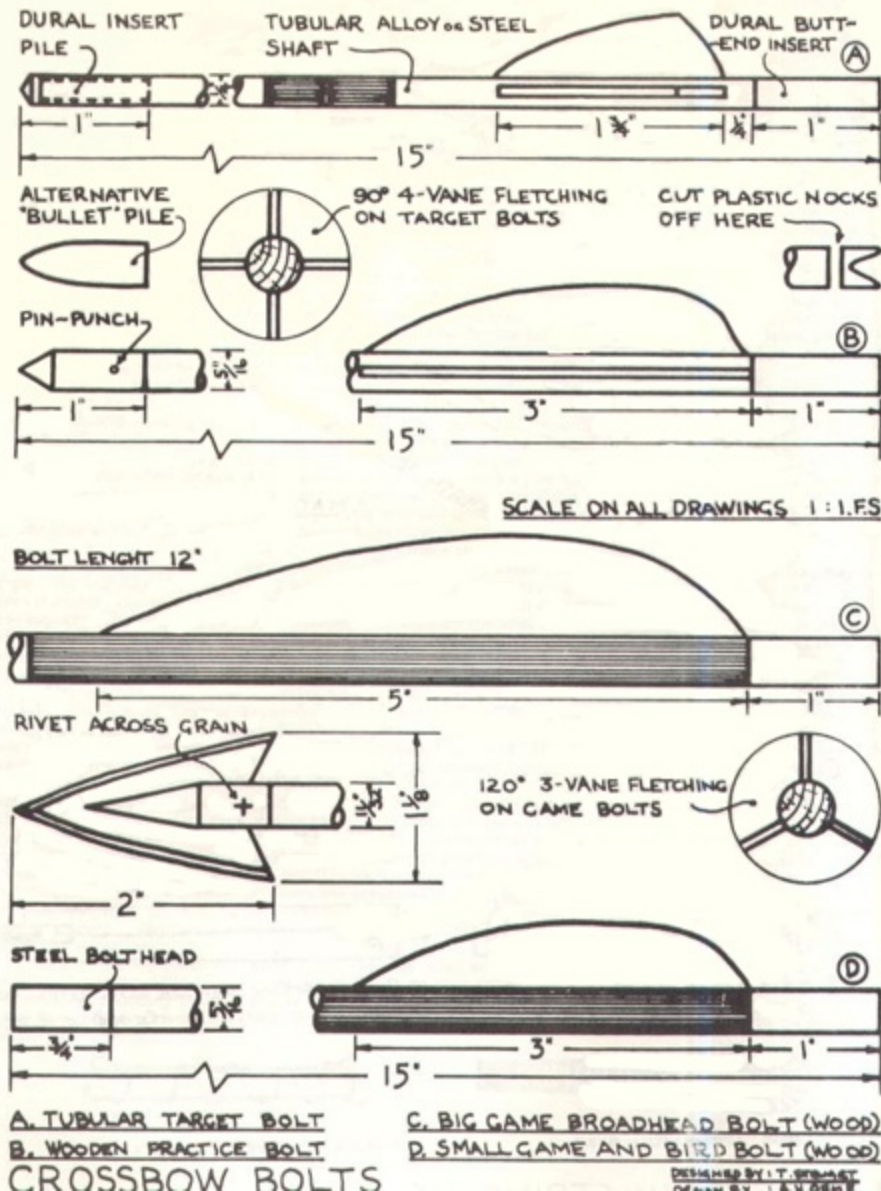
which the crossbow will deliver an accurate smashing blow every bit as effective in killing power as a small calibre rifle bullet.

Chapters

BOLTS

No matter how good a shot the crossbowman is, or how well designed his crossbow, he will only shoot consistently well with good bolts. Cheap or inferior bolts are never an investment and you should at all times purchase the best you can afford. This applies particularly to target bolts; these should be matched in weight and balance if they are to be used for competitive shooting.

A crossbow bolt as we know it today is simply a short arrow consisting of three main parts: the head, shaft and fletchings. Crossbow bolts vary in length, diameter and material with the best all-round length being 5" with a shaft diameter of 5/16ths of an inch. This length and diameter of shaft is well suited to practice target bolts and small game blunt-headed bolts. The best length for target bolts for competition use is also 15", but they are best made of alloy tube with a diameter of 1/4". In general, wood shafts of birch or ramie are well suited and economical for hunting bolts, with the shafts of a hunting bolt fitted with a large broadhead being about 2" long on 5/16ths diameter shaft instead of the usual 15". Due to the heavy steel head, it is necessary to cut down the shaft to 12" to reduce the weight.



Bolts may be fletched with the traditional grey goose or turkey feathers or, if preferred, the smaller plastic vanes. I would advise turkey fletchings on practice bolts and also blunt hunting bolts, with the length of fletching 2-3 inches for these bolts. On a heavy broad head bolt with a 12" long shaft, fletchings of turkey feathers should be at least 5" long and from 3/8" to 3/4" deep at the highest point. This larger type of fletching will better guide the heavy bolt to its target.

Plastic vanes are ideal for target bolts and will be found to add some yards cast to your crossbow as compared with the usual turkey fletchings. Shafts may be fletched with either 3 or 4 vanes. However, I find that when target shooting, closer grouping is obtained with a 4 fletch bolt, especially if plastic type vanes are used, though for hunting purposes I find a 3 vane fletch quite accurate enough. Fletchings should be placed 3/4" - 1" from the butt end of the bolt.

All crossbow bolts used for target practice and competition match shooting should have the butt end of the shafts reinforced with a plastic nock. This reinforcement will prevent one bolt splitting another due to close grouping. No nock to grip the crossbow string is required, so the fingers of the nock are sawn off leaving a reinforcement of about 1/4" in length. This reinforcement is optional on hunting bolts as there is no danger of shafts splitting due to close grouping, but as bolts have been known to split due to string drive I would advise this reinforcement on hunting shafts if employing a draw weight of over 75 lb. Whatever type head your bolt has, be sure it is firmly attached to the shaft. Target piles and blunts should be held on the shaft by prick-punching the jacket, and broadheads by drilling a small hole through the jacket and shaft and riveting on with a small cobbler's brad filed smooth.

Wood bolts for target use are best wax polished rather than varnished, as this enables them to be more easily withdrawn from the target and also assists an easy flight along the barrel.

If you are fletching your own bolts do remember to fletch any one shaft with feathers from the one wing of the bird and not have feathers on the shaft taken from both right and left wings. Your bolt will steer an erratic course unless all the

feathers are from the same wing. On a three fletched shaft the vanes are placed 120 degrees apart, the cock feather being a different colour from the other two shaft feathers.

Whether you are using bolts with target piles or blunt heads, be sure at all times to get into the habit of always placing the cock feather down the slot. This will ensure that if you are ever using broadhead bolts when out hunting, this habit of placing the cock feather down the slot will enable you to place the broadhead bolt on the slot correctly with the broadhead aligned with one edge down the slot.

Target bolts should be crested with several colours an inch or so in front of the vanes as a means of personal identification. The new fluorescent poster colours are particularly suited for creasting hunting shafts and show up vividly even in a poor light, an invaluable aid to recovery. I usually crest my hunting bolts from the butt end of the shaft down between the feathers for about six inches in one colour only. The most outstanding colour I find to be orange fluorescent poster paint. A coat of clear lacquer over the creasting will prevent the friction of the bolt down the barrel stripping your creasting off the shaft, and messing up your barrel with paint. By using a different colour creasting for broadheads and blunts you will be able to choose the correct bolt from the quiver by the colour of the shaft; most important if an unexpected shot presents itself.

Matched tournament bolts should be numbered to enable you to identify a poor flier (perhaps bolt No. 3 shoots a bit to the right, and No. 8 flies a trifle high). This numbering will enable you to make the necessary allowance when shooting those particular bolts, it will be necessary to practise frequently with your tournament bolts to observe the characteristics of each one before the numbering will be of any value in correcting your shots. This practice will be time

well spent when you stand on the shooting line at your first tournament, confident in the knowledge that provided you shoot well, you know what performance to expect from your bolts.

Chapter 9

STRINGS AND STRINGING

We come now to the crossbow string, that comparatively slender line that draws back the limbs of the bow and upon release casts the bolt from the stock. These strings are taken very much for granted; however, it is this string that takes the roughest abuse of any part of your crossbow, and when you consider the tremendous speed with which the bow limbs return from the bent position, it is remarkable just how much use one does receive from a good string.

Many materials will make good strings; among the best perhaps are the synthetic fibres fortisan and dacron. The time honoured linen thread is a reliable string material with little stretch and usually will show some signs of wear before breaking completely. This will enable you to have it replaced with a new string before breaking occurs. Fortisan will make a much lighter string than linen as it is stronger, approximately 16-1/2 lb. per strand as against an average of 8 lb. in linen, and consequently will require fewer strands to the string. This in turn will increase the cast of your bow quite considerably. Fortisan must be thoroughly stretched before use and it is an excellent string material; its only disadvantage is that it gives little or no warning prior to breaking.

The correct bow string ratio for a string to suit your crossbow I find to be 10 to 1. That is, for every pound your bow pulls you will require a 10 lb. breaking strain. Thus a bow drawing 50 lb. would have a breaking strain of 500 lb. From this you will see that a fortisan string will be approximately half the weight of a linen string. Perhaps this ratio of 10:1 may appear excessive when compared with a hand bow string poundage ratio of about 3:1. However, my personal experience of bowstrings that I have made on the endless skein principle, with the loops having half the number of strands that are in the full body of the string, shows that a ratio of less than 10:1 will stand up to only a few dozen shots, whereas the 10:1 ratio shows good cast combined with safety. On hunting crossbows I increase this ratio to 12:1, feeling it is safer to be a little on the heavy side than perhaps have a string break at a crucial moment during a hunt.

Crossbow strings should be well and thoroughly beeswaxed, with the loops and centre stoutly served with a strong whipping. The centre serving should be 4" long and equidistant on each side of the stock. With target crossbows a good idea is to bind the exact centre of your string over the serving with a few turns of brightly coloured cotton thread. This will ensure an even placing of the bowstring when in the cocked position, the cotton marker coming between the forks of the release latch for every shot, and will also indicate if any lateral movement has occurred in the bow. It is essential for accuracy that your bow is at all times positioned exactly central in the stock. As your latch cover is directly above the latch fork, it is necessary to have a small perspex or glass circle in the latch cover to look through at the centre serving around the latch.

It is essential to ascertain that your bow is properly braced, and any stretch that may show in your string after use

should be taken up by twisting the string a few turns in the direction of the original twist. If a string breaks on a self wood or composite bow the chances are that the bow will smash as the limbs continue to travel forward with no string to halt them. An alloy bow may break, a steel bow should not, but in any case an extra strain is placed and must be avoided. Variation in fistmele will affect the bow's performance and may also damage the bow.

Do not be tempted to use a string that is too short for your bow, as this will reduce the bow's cast and may smash or fracture your bow limbs breaking your strings at the same time. With commercially-made crossbows the makers will inform you of the correct bracing height, this should be strictly observed at all times.

When you go out shooting, always carry a spare bowstring with you. They are no trouble to carry if the butt plate of your crossbow has a recess into the butt to take the spare string, similar to those seen on army rifles to carry the pull-through and oil bottle in. The butt plate has a small hinged flap that opens and closes with a flick of the finger: a safe dry place to keep your spare string, and somewhere you will not forget it.

Composite crossbow bows with recurve tips are best strung with the assistance of a bracing string. This string is slipped on to an extra pair of outer bracing nocks $\frac{1}{4}$ " out from the true nocks which are $\frac{1}{2}$ " in from the extreme tips. It is then a simple matter to slip on the true string.

For straight ended bows of light draw weight the following method of stringing is easily done and no bracing nocks are necessary.

Slip one bowstring loop over the bow tip and slide it in a few inches towards the centre of the bow. The other loop is now placed around the bowstring nock at the opposite tip. The crossbow butt is now placed on the ground between your feet, hold the bow tips firmly in each hand, one hand in position to slide the un-nocked loop out towards the string groove. Apply downward pressure on the bow limbs to flex them and, at the same time, slide the un-nocked bowstring loop along the limb until it slips into the nock at the tip of the bow. Be sure that the bowstring is firmly in position before you release your grip. Should the bowstring stretch slightly after it has been shot a few times it may be shortened by unnocking it and twisting the string a few turns in the direction of the original twist.

Some years ago I devised an alternative method of stringing steel alloy, or fibre glass bows of moderate poundage; the method being as follows.

Place the crossbow butt against your abdomen, in the position you would assume when about to cock the bow.

Now turn the crossbow until the bow limbs point vertically up and down, the butt plate across your abdomen.

Place one of the bowstring loops firmly in the *lower* bow nock and rest this bow-tip on the ground, keeping the butt in contact with your abdomen by slightly flexing your knees.

Grip the *upper* bow limb with your left hand a few inches below the nock, holding the free end of the bowstring in your right hand just below the loop.

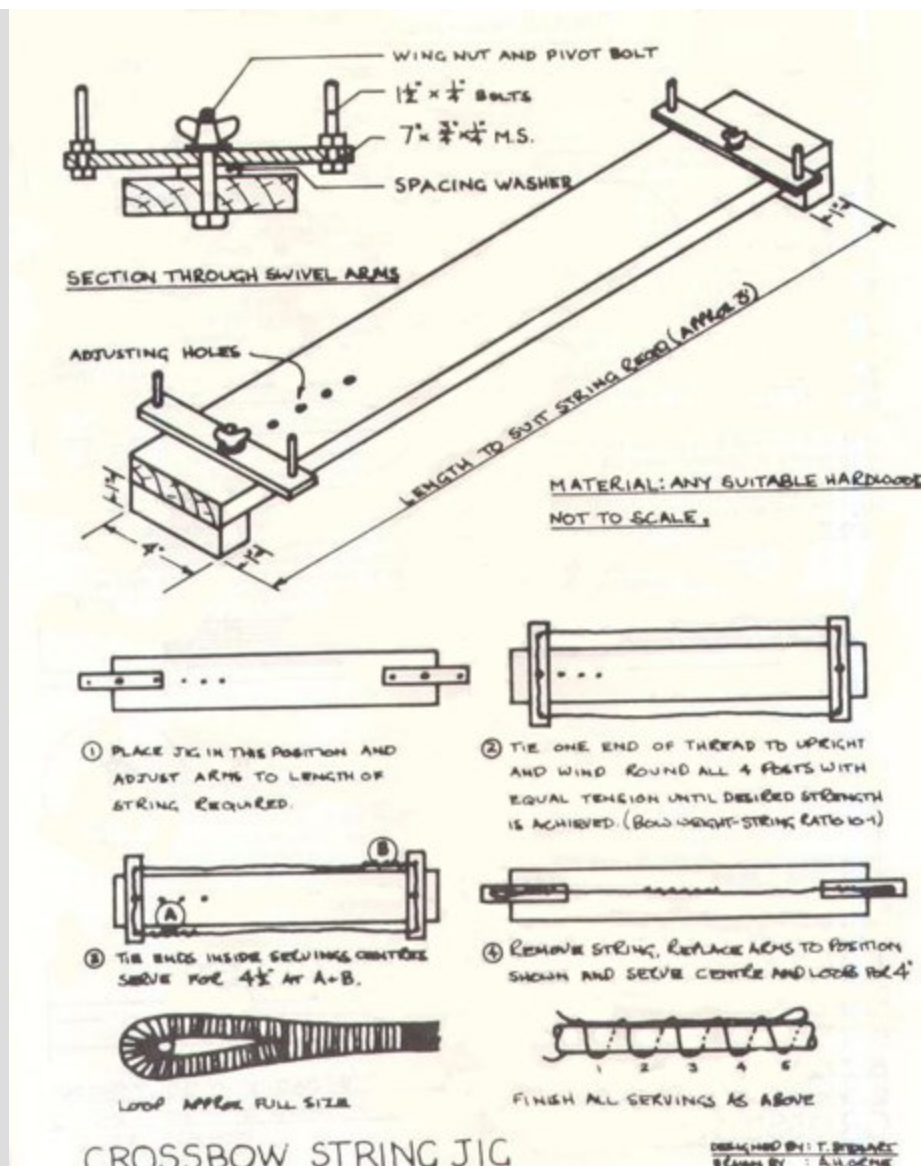
Flex your knees further using the weight of your body against the butt to bend the lower bow limb against the ground.

Now pull the upper bow limb towards you with the left hand, slipping the bowstring loop over the nock with the right hand.

Make sure you don't trap the fingers of your left hand between the bowstring and the bow limb.

The combined pushing' weight of your body, carefully controlled, and the 'pulling' action of the left hand makes this a simple method of stringing most bows of moderate poundage, though I do not recommend this method with composite bows in case you damage the bow tips.

Modern steel bows are seldom any thicker than 1/4" resulting in a rather sharply angled bow nock than is usually seen on a bow of thicker material. This, together with a steel bow's tendency to recoil, may cause severe wear on the bowstring at the loops. To overcome this, a string loop reinforcement in the form of a fine leather washer placed over the nocks, between the bow tip and the string loop, will effectively prevent damage to the string loops.



Chapter 10

CROSSBOW AND ACCESSORY COSTS

When purchasing or constructing a crossbow you will wish it to be a fine one, and therefore it is advisable to purchase the best you are able to afford, and this does not necessarily

mean the most expensive. I have seen some very good crossbows by amateur makers for as little as £8 to £9, and others at about twice the price that were not half as good. Both types of course were not made by the same person. Do bear in mind the advice given in the earlier section on *How to choose your Crossbow* and your choice should not be too difficult.

If you are considering constructing your own crossbow, be sure to use the best materials you can obtain, and spare no pains during construction.

A good hunting crossbow to simple design will cost from around £15 to £20, and a more de luxe type with safety catch, adjustable trigger pull, inlaid stock, etc., may cost up to £30 if it has a composite bow. Good target crossbows vary from about £25 to £30, or up to and over £40 for a de luxe model. How much you pay will depend on where you purchase your crossbow, or who made it, therefore the prices stated will be used only as a guide to costs. If the sum of from £15 to £30 would seem rather expensive, bear in mind that at least seventy-five per cent of the costs on a custom hand-made crossbow is attributed to labour, and it does take very many hours of careful workmanship to produce a fine crossbow.

The material costs of a good crossbow, if building it yourself, need not exceed £5, and that is using very good materials. Time expended may be from 12 to 20 hours or more, depending on what tools you have available and your ability to use them. Patience, good workmanship, and a keen eye for detail are important, and there is no doubt that anyone with a good standard of wood and metal working ability will be able to construct a good crossbow, provided his efforts are tempered with a little patience.

We come now to crossbow bolts and their costs, and as mentioned in an earlier section, these are perhaps more important to be of good quality than your crossbow. You will shoot quite well with first class bolts from a not-so-good crossbow, but the finest crossbow will never be able to shoot badly made bolts accurately.

For a start I should advise a box of a dozen wood practice bolts until you become accustomed to your crossbow. These are reasonably priced at around £2 to £3 for the dozen, and will be ideal for your first practice shots. A superior set of practice alloy bolts may be purchased in sets of eight, from between £3 to £4 the set, and for competition match shooting a set of alloy bolts matched in weight and balance will cost from £5 to £6.

You may wish to make your own bolts, and this will reduce your costs to that of material only, piles, shafts, fletchings, crestring paint and a small tube of adhesive for affixing the vanes to the shaft.

A quiver, while not essential for target work, is certainly convenient, as keeping bolts in your pocket will eventually wear holes through the pocket linings of your trousers. A good cheap quiver, ideal for holding target or small game bolts, is the leather pocket quiver that fits neatly into the hip or side pocket of your trousers. This quiver will hold comfortably 8 bolts for target use and will accommodate up to about a dozen blunt bolts for small game hunting. You would perhaps prefer a side quiver for your target bolts.

These are usually a tubular shape in leather, costing about £2, or may be purchased in a flat style with a separate compartment for each bolt in your set, this type being a little more expensive, probably from £3 to £3 10s. If you prefer to make your own quiver, it is simple enough to make

up a cheap replica in canvas or rexine at a cost of only a few shillings.

For hunting, your quiver must be silent, and positioned where it is not liable to snag or catch on bushes, etc. For this reason, I prefer the hip pocket quiver; the bolts do not rattle about when in it, and are held firm in the quiver by its pressure against your hip. It is also protected by the body and will not snag on bushes. The slight disadvantage may be that the amount of bolts you carry is limited to about a dozen blunt bolts if hunting small game, or if carrying broadheads a maximum of six. If carrying a few of both types it is difficult to tell what bolt is what by touch as you will not see the butt end easily without twisting well round. This would not be the case if the bolts' butt ends were out to the right, as they would be at a target shoot using a hip quiver in the right hip pocket. When hunting, this tends to let bolts pull out on branches, etc., so I point the butt ends when hunting to the left side well behind my back. This keeps the bolts free from all obstructions, yet it is an easy matter to draw one from the quiver. The maximum of six broadheads in this type of quiver is quite adequate for big game hunting, as you will not expect to lose six broadheads (let's hope); besides, I doubt if you will ever get six shots at big game all on the one hunt. The same applies to small game blunts; if your quiver holds a dozen blunts, that is enough for a day's hunt and provided you only fill your hip quiver with any one type of bolt at a time, either blunts or broadheads. you will probably find this quiver the best for hunting.

So far we have mentioned crossbow bolts, spare string and quiver -- these being the essentials. You need not buy another thing. The following are useful and may be acquired from time to time when finances permit. A stout canvas carrying case with sling will protect your dismantled

crossbow when not in use and is convenient for taking your crossbow to matches, etc. These cost around £3 depending on quality, or perhaps you may prefer a stiff fibre carrying case, very similar in appearance to a long slim suitcase, in which you can store your crossbow, bolts, quiver, and any other accessories you may require: these cast around £4.

When shooting at regulation targets, bolts are at times abominably difficult to spot on the target face, especially at ranges over 60 yards, and it is impossible to correct your shots if you do not know where some of them hit. For this reason you may care to add the luxury of binoculars or a monocular to your accessories. These vary in price considerably, but do take into consideration the weight factor when making your purchase.

On comparing the essential costs of what is required for you to commence shooting the crossbow with the costs of commencing other sports, I find that it is no more expensive to shoot with the crossbow than to start any one of a dozen other sports, and in fact is a good deal cheaper than many.

Chapter 11

LOADING THE CROSSBOW, AND SAFETY

The very powerful medieval hunting and military crossbow was bent mainly by mechanical means, windlass, lever, cranequin, screw, etc., and the less powerful crossbows bent by hand with the assistance of single or double foot stirrup to hold the stock firmly against the ground, while drawing back the string, using the full power of the back and arms.

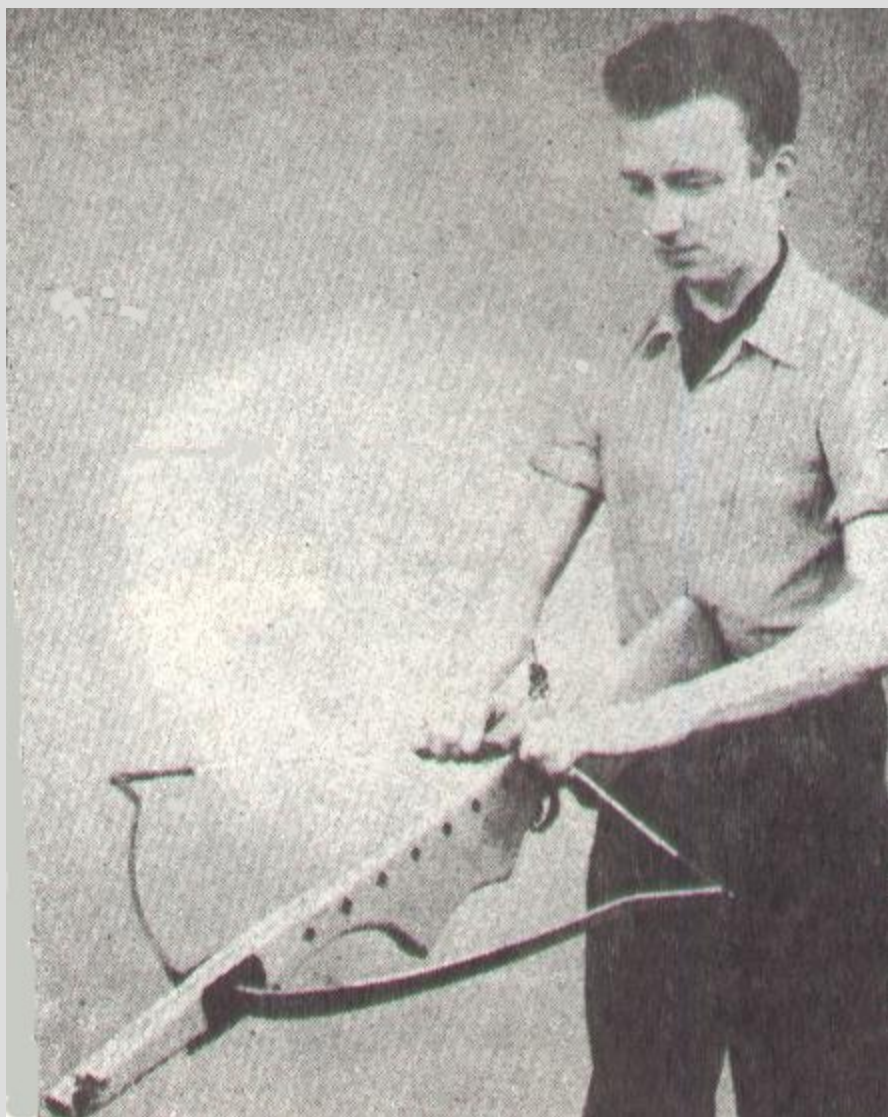
Today's modern crossbows do not require the power to discharge a heavy bolt or quarrel with sufficient force to penetrate plate or chain mail as did the medieval crossbow, and so are of a moderate poundage, quite easily drawn by hand without mechanical assistance. The following may be used as a guide to the poundage you may comfortably draw. The average man will comfortably cock poundages up to 80 lb. though much depends on the individual's strength, and to some extent the condition of the muscles of the lower abdomen, as the butt may cause some abdominal discomfort when attempting to cock very high poundages. A very strong man will be able to cock poundages of upwards of 100 lb. to around 150 lb. without mechanical aid.

Most target crossbows with draw weights averaging 45-55 lb. are easily cocked by any man and most women, though if the ladies experience any abdominal discomfort, this may be overcome by employing a light foot stirrup for assistance, though this will naturally add some weight to the extreme fore-end of the stock. An alternative method is to use a metal footplate fitted with a small hook; this footplate is laid on the ground at the shooting line and on it you place one foot. A small ring attached to the fore-end of the stock is then placed in the hook and the string drawn back. After cocking the crossbow the ring is disengaged from the footplate hook and you may load and take aim with no extra weight on the stock's fore-end other than the small metal ring, the weight of which is negligible.

The following method is that by which the modern crossbow is usually cocked.

Place the butt firmly against your stomach, then, gripping the bowstring with both hands close to each side of the stock, pull back evenly until the bowstring is well under the latch cover and securely caught in the release mechanism.

When properly cocked, a sharp click may be heard. When cocking the weapon the last few inches, *brace your thumbs firmly against the stock directly behind the latch cover*). This will greatly assist in the cocking. Some crossbows are specially fitted with a shaped block to fit the thumbs to assist leverage when cocking the bow.



Cocking the crossbow

After your crossbow is cocked, you are now ready to place the bolt in position for discharge. After the bowstring is in the cocked position around the latch, replace the left hand along the underside of the stock to the forehand position you will grip when shooting, keeping your fingers below string level. The butt should remain in the cocking position against the lower abdomen with the stock directed towards the ground just ahead of you. With your right hand draw a bolt from the quiver, holding it below the fletchings at about the level of the cresting. Place the bolt firmly on the groove with the cock feather set in the slot. The cock feather is identified by being a different colour to the others on the shaft. Slide the bolt back under the latch cover until the rear end passes between the forks of the release latch and touches the bowstring. The bolt, being lightly gripped by the bolt clip under the latch cover, will not fall out if the crossbow is pointed vertically up or down.

Do not move the stock about during the loading operation. At all times keep the stock directed just ahead of you at the ground. It often surprises me how many beginners let the stock wander in all directions during this simple action of placing the bolt in position; and the number of times the loaded crossbow ends up pointed at the nearest spectator, usually me, is not surprising but horrifying. Even though you are to the side of and behind the shooter, where any spectators should be, there is always the one who will turn to the side when loading and end up with crossbow loaded, finger on the trigger, pointed at someone standing at the side.

After loading the crossbow, place your hands in the correct hold positions, with the index finger along the trigger guard until ready to shoot.

Every possible safety precaution should be observed when handling the crossbow during loading and shooting, at all times bearing in mind that it is a lethal weapon. There is no such thing as a 'toy' crossbow.

Of all accidents caused with firearms, ninety-nine per cent are caused by carelessness. Never yet have I heard tell of an accident, fatal or otherwise, with the modern crossbow, so if there ever is a first one do not let it be you who caused it. If I may be permitted to state the obvious, never point your crossbow at another person; also, if game hunting be sure to consider the area behind your quarry in case of a miss. If your crossbow is fitted with a safety catch, make proper use of it by keeping on safe until you are ready to shoot.

At times I have been asked if I did not think the crossbow to be a dangerous weapon to be lying around in case a child may lay hands on it. From that point of view the crossbow is probably the least dangerous of weapons. A child may be able to load and close the chamber of a rifle, pistol or shotgun, but I have yet to see the child who could even string a modern crossbow let alone cock it. You would not leave a cocked crossbow lying around if for no other reason than because it would be harmful to the bow. For the same reason your crossbow would certainly be unstrung when not in use if not completely dismantled. It is most unlikely indeed that any child could come across your weapon and be able to place it in the cocked and loaded position.

Chapter 12

STANDARDS OF SHOOTING AND CROSSBOW ROUNDS

How accurate is the crossbow? Naturally, much depends on the skill of the user and the design and quality of his crossbow and bolts. However, the crossbow's potential accuracy is quite extraordinary. At the American National Meet in 1955 Paul Eytel of America made six golds at 50 yards on the regulation 24-inch face. This was a very close group indeed; not only did all six bolts group inside the 4-3/4" diameter gold at 50 yards, but five of the six bolts grouped within a radius of 1-1/2". A grouping of six bolts within a 6-inch radius at a distance of 30 yards is average, though with some practice you may expect to do very much better than this. In fact, crossbowmen dislike shooting groups at 30 yards due to the danger of splitting bolts with close grouping, so at 30 yards you may expect to do a six gold end quite regularly, providing your shooting style is consistent.

The York round is shot at the 24" face with 72 bolts at 100 yards, 48 bolts at 80 yards and 24 bolts at 60 yards.

One of the most popular rounds is the American round of 30 bolts at each of the following ranges in this order: 60, -50, -40 yards, six sighting shots allowed at 60 yards.

The Western round is shot at 60 and 50 yards, four dozen bolts at each range, and is popular with less danger of splitting bolts due to close grouping as may occur at shorter ranges.

The standard target face is set out as follows: gold, or centre circle known as the gold and not the 'bull', has a diameter of 4-3/4". A 1" diameter black or white spot may mark the exact centre of the gold but has no scoring significance. Working outwards from the gold there are red, blue, black and white circles, each 2-3/4" wide; scoring values from the gold are 9, 7, 5, 3, 1. Target faces may be either hessian,

duck, or paper. Targets purchased from stores are the usual straw type and are basically tightly bound straw coils sewn together. A good thick target is required for crossbow shooting effectively to stop complete bolt penetration.

Wire-bound straw bales are useful for targets but are so heavy that they usually are left on a permanent site. Also, If a bolt does penetrate far in, you will not get it out without opening the bale. The target face for regulation crossbow shooting is 24" in diameter and must be positioned with the centre of the gold exactly 4 ft. above the ground. Six bolts are shot consecutively, this is known as an 'end'. Although all competition shooting is at a 24" target *face* , it is usual to use a 48" target. The 24" diameter face, set in the centre of the 48" diameter target, allows a good margin for misses off the target face.

Chapter 3

THE BOW PISTOL

The bow pistol is a smaller edition of the crossbow. This weapon, fitted with a small bow drawing as an average up to 50 lb., is very similar in appearance to a pistol, and is shot in the same manner with the arm extended, discharging a short bolt from between six to eight inches in length. Considerable amusement may be derived from a bow pistol shooting at targets up to 30 yards or so, and though it may be practicable for hunting small game, I doubt very much its hitting power for this purpose.

Having made bow pistols drawing 50 lb., at a 10 inch draw, I found some difficulty in cocking the weapon easily, even

though of such a light draw weight, due to the closeness it is held to the body prior to cocking. This close position allows the arms little leverage to draw back the bow string easily, so it is usual to employ a small wood lever to cock these tiny weapons.

In medieval times the bow pistol was the weapon of the assassin. Some of these weapons had draw weights of up to 100 lb. and over, the cocking device being either screw or lever, and yet were so small and compact as to be concealed in the wide sleeves of the coats and gowns worn during that period.

A powerful bow pistol of this type mentioned exists with an overall length no longer than that of a man's hand.

Today's modern bow pistols are usually about 10" to 12" in length, fitted with a fixed, or, at times, an adjustable sight, and will discharge a six inch long bolt with accuracy at short range. Bolts of this type are invariably 1/4" diameter wood, and generally unfletched, though two vane fletching is worthwhile for added accuracy.

When constructing a bow pistol the basic principles of crossbow construction should be closely observed. Although no butt, comb height, etc., has to be considered, as with a standard crossbow, it is essential to form a really comfortable pistol shaped butt to ensure a steady hold, enabling the trigger to be pressed and controlled in an easy manner. This grip should be strengthened with a short length of 1/4" diameter dowelling inserted in a press fit, and glued up through the grip after it has been drilled out.

These weapons are by no means 'toy', even though of light draw weight; I well remember shooting a bow pistol

discharging its small bolt to penetrate a 1/4" thick deal plank from ten yards!

Chapter 14

THE CROSSBOW'S LEGALITY

'Are crossbows legal weapons?' 'Do I require a licence to possess a crossbow?' Very often I am asked these questions and though it is a somewhat 'tricky' legal question on a point of law, I shall endeavour to answer it as best I can.

There is nothing in British law that states a person requires a licence to possess a crossbow. It does not come under the Gun Licence Act of 1870 which refers to 'Any kind of *gun* from which any shot, bullet, or other missile can be discharged'. If one could legally term a crossbow as a gun it would come under this Act; however, the Act refers specifically to, and states, gun. It is generally accepted that guns discharge their missiles by an expansion of gases caused by an explosive charge, whereas a crossbow discharges its missile by catapult action.

The Firearms Act uses the term 'lethal barrelled weapon'. A crossbow is a lethal weapon but it is not barrelled in the sense of the Act. The law apparently refers to 'guns' in the conventional sense.

Some years ago a young man was fined by a local magistrate for being in possession of, and discharging, a harpoon-gun without a licence. As a harpoon-gun has a barrel (of sorts) and is named 'gun', the magistrate obviously interpreted the Act to apply in that particular

case. The young man in question paid his fine and so admitted his guilt in breaking the law. But did he break the law? No explosive charge was used, his harpoon being discharged by the catapult action of strong rubber strands. Had he pleaded not guilty and gone for trial, it would have been a most interesting point of law brought to light, and I am sure he would have been acquitted.

A recent inquiry into the legality of crossbows brought the following reply from The Justice of the Peace.

Although there is no doubt that a crossbow is a lethal weapon, we do not think that either a gun licence or firearms certificate is required.

This does not, however, mean that you can go out and shoot any and every wild creature at random. You may not require a licence to possess a crossbow, but you will require one to shoot *game* .

An important legal consideration in British law is your reason for being in possession of a crossbow. Should the authorities find you in possession of a crossbow on private land without the owner's consent, then you could be in trouble.

To be in possession of a crossbow when on your way to your archery club or practice shoot, etc., should not place you in conflict with the Law.

In some American States it is illegal to hunt with the crossbow and in one at least it is illegal even to own a crossbow. This sad state of affairs has come about due to the indiscriminate use of the crossbow by irresponsible people, not only to hunt, but for poaching game.

Practically anyone can handle and shoot a crossbow fairly well in a very short time; this, together with the crossbow's

hitting power and silent operation, makes it an ideal poacher's weapon. In very many American States, poachers were taking long range chance shots at deer and other animals, at times shooting from moving cars, with the result animals were found wandering about wounded and maimed by crossbow bolts. Under the circumstances it was not surprising the local and State Authorities restricted or disallowed the crossbow's use. Any similar indiscreptions in Britain may also result in such restrictions or an eventual complete banning of the crossbow.

By only using the crossbow against vermin or legal game in the proper seasons; by being in possession of a game licence when necessary; and by only hunting on land on which you have permission to hunt you will keep clean in Britain the so-far unsullied name of the crossbow.

The End

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**HUNTING CROSBOW CONSTRUCTION AND
ASSEMBLY
(Drawing Ref. AHO/16566)**

The first essential is a piece of good hardwood for the stock, a piece that is well seasoned and not liable to twist. If a full sized plank is not available, scrap pieces glued together will do, provided the gluing is well done. Many modern glues and adhesives make a joint stronger than the material they

unite, so you may be sure of satisfactory results. Recommended hardwoods are French or African Walnut; or Sapele Mahogany.

1. Cut out the general outline of the stock, following the dimensions carefully, and see that the 'barrel' is perfectly straight and level along the top.
2. Chisel out the recess to hold the trigger group. 2" x 13/16". Taper down to 1-1/4"x 13/16".
3. Between this recess and the end of the barrel, cut your bolt slot exactly down the centre. After cutting the bolt slot wrap a length of 5/16" dowel in sandpaper and make a 1/8" chamfer on each side of the slot by rubbing it down the slot. Your bolt when shot will fly along this runway with one feather down the slot. If available to you, this bolt slot is most easily cut using a small circular saw set to a depth of 1/2".
4. Now make your latch using the detail plan for measurements. The other views of the latch shown in the stock are not to scale and are only intended to show the cocked and released positions of the latch, and its assembly.

If precisely made this trigger will pull like a sporting rifle with a bow draw weight of up to about 85 lbs. The latch is slotted in the centre to allow the rear end of the bolt through to touch the bowstring prior to release. The part of the latch in contact with the bowstring must be filed perfectly smooth and finished with emery paper to ensure a clean and friction-free release to the string. The 1/8" to 1/4" play either side of the latch and trigger should be taken up with a washer each side of the pivots.

The pivot holes in the stock and trigger unit must be placed exactly precise and all parts must be smoothly finished and work freely. A cover plate (PLASTIC) is now screwed over the pivot pins on each side of the stock.

5. The opening in the stock for the bow is now cut like a flat tipped inverted 'V' as shown on the plan. The 'tip' of the 'V' should be 15" from the bowstring position on the latch when cooked. The 'tip' of the 'V' slot should be 5/8" from the top of the stock. The extreme fore-end of the stock is 1-5/8" deep.

6. Cut out a pair of mild steel bow plates 1/8" x 2-1/2" x 1-1/2" as in the plan. Drill through stock and bow plates with a 1/4" diameter drill and fasten the bowplates to each side of the stock by passing a length of 1/4" Screwed Rod through the holes in the stock and plates and tighten up against the stock with 1/4" steel nuts.

7. The lock plate for fitting to the underside of the bow slot is now cut. Mild steel again being preferred material 1/8" x 3-1/2" x 1-1/2", and two 1/4" holes drilled through.

8. Now cut a hardwood wedge to fill in the space in front of the bow slot. This wedge is pressed into place by the lock plate when the bow is in position and holds the bow *immovably* in the stock when shooting. (This is essential for accurate shooting).

9. Combination screws are inserted in the underside of the stock, one each side of the bow slot. The lock plate slips over the threaded ends of these screws protruding from the stock, and is clamped firmly against the bow and wedge with two 1/4" wing nuts.

10. The latch cover is simply made from hardwood and is screwed firmly behind the latch with two 1-1/2" long wood screws.

11. The sights are simple and effective for hunting purposes. The rear peep sight may be made at home if desired, but any gunsmith will supply you with a rifle single hole aperture *eyepiece*, 1/16" diameter hole, that will suit admirably. The threaded neck of this type of eyepiece is pushed through the 3/16" diameter hole in the rearside strip and riveted on. 3/8" above the exact centre of the peep sight a small 'V' notch sight should be filed in the steel strip. Your rear-sight when complete is bent at right angles 3/4" from the bottom and screwed to the underside of the latch cover with two small flat-headed screws.

The *foresight* consists of a steel strip screwed to the sides of the stock with an 1/8" diameter hole drilled through to take the foresight rod. Exactly above the centre of the bolt slot, a small washer is attached to the foresight rod for sighting. It is *imperative* that the foresight bead and the centre of the rearsight peephole are exactly the same height from the top of the stock. A small rubber pad may then be glued to the base of the rearsight strip immediately over the screws. This rubber pad lightly grips the crossbolt prior to release and enables the Crossbow to be pointed downwards without the bolt falling out.

BOW CONSTRUCTION

Obtain a length of Noral 75 flat Extruded Bar 36" x 1" x 5/16". Mark out the dimensions as shown. Joining up all the points with straight lines then cut out with a hacksaw. File up smoothly to run the lines cleanly together rather than showing sharp angles. Round off any sharp edges and be

sure your bow nocks are as smooth as *glass* by using fine emery paper. (Dual "K" Alloy is also suitable).

To bend the alloy to shape use a block of hardwood about 20" long x 3" x 2" with a 1" slot x 3/8" cut at 2" from one end. Place the bow in a strong vise and bend the limbs forward to form a reverse curve at 3" from each end. Now bend backwards at 2" on each side of the bow's exact centre. When bending normal to shape use a firm steady pressure, any sudden push or jerk is liable to crack or break the alloy. Take time and be patient over the bending to be sure both sides of the bow are bent *exactly* evenly at *every* point. Finished draw weight of this Bow is 70 - 75 lbs. approx.

When your bowstring is on, the "Fistmele" or distance between the string on the braced bow and the bow at its centre, should be 3-1/2" to 4".

Take the measurements of the finished bow from nock to nock and order a bow string from an archery supply firm. Crossbow bolts may also be purchased, or you can make your own by assembling the parts. By ordering several 30" long x 5/16" diameter shafts and cutting these in half, this will make two bolts from each shaft. A suitable number of brass or steel points to fit the shafts also some turkey fletchings for flights and a touch of clear lacquer for the shaft will complete your kit.

ASSEMBLY

A. Fit the bow into the slot being sure it is positioned exactly in the centre. It is imperative that the bow is, at all times,

inserted into the stock with the tapered edge to the *bottom* of the slot. If fitted with the other edge to the bottom the bow will lose some of its power and cast.

B. Place the small wedge into position to fill the space in front of the bow.

C. Replace the lock plate on the underside of the slot and tighten up firmly with the wing nuts to lock the wedge tightly against the bow. Your bow is now ready to be strong.

LOADING AND SHOOTING

1. To cock the crossbow, place the butt firmly against your stomach, then, gripping the bow string with both hands close to each side of the stock, pull back evenly until the bow string is well under the latch cover, and securely caught in the release mechanism. When properly cocked, a sharp click may be heard. When cocking the weapon the last few inches, brace your thumbs firmly against the stock directly behind the latch cover. This will greatly assist in the cocking.

2. The crossbow is held and shot like a rifle, aiming along the sight provided on to the target. The rear sight combines both a peep sight for close targets and a notch sight above it for more distant targets. Up to 20 yards, use a rear peep sight in conjunction with the front bead sight. Over 20 yards, use the rear 'V' sight. Shoot the crossbow by holding steady and squeezing the trigger. When shooting, your forward hand should grip the stock at the under swelling edge, keeping your fingers *down below the string leve*.

3. Safety First. The Crossbow is not a toy, but a *Deadly Weapon*. Treat it as such. When loaded, keep it pointed in the Direction of your Target, and NEVER point it at another person.